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# HEREDITY AND ENVIRONMENT



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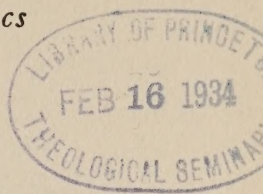
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# HEREDITY AND ENVIRONMENT

*Studies in the Genesis of Psychological Characteristics*



By  
GLADYS C. SCHWESINGER

EDITED BY  
FREDERICK OSBORN

NEW YORK  
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1933

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## PREFACE

This volume was prepared as part of an attempt to appraise the present status of knowledge in the field of eugenic research. An understanding of the limits set by heredity on the development of various characteristics and the range of modifications effected by environment is, however, basic to many other social problems, and is a subject of transcendent human interest. It has been widely discussed from earliest times. It is woven into the themes of the greatest novelists. And yet only very recently has it been possible to consider it a problem for objective scientific research. The attack of the scientist had to wait on the development of tools of measurement and of experimental techniques, long after the genius of Galton had pointed out the importance of the problem and made the first excursions. At any earlier date than the present, a summary of studies would have been premature. The present attempt is in a way preliminary, a reference work and guide to the probable scope of the more solid structure of knowledge which will be available in another ten years. As such, we hope it will be found of interest to all those concerned with the social problems of mankind.

It has well been said that there is no science without measurement. Hence our first concern has been to offer a preliminary survey of the status of measurement for the major mental characteristics. We have attempted here only a summary of this subject, with extended references to authoritative sources. For the purpose of discussion, the mental field has been divided into intelligence and personality. Special abilities, such as music, art, mechanical ability, and achievement in general, have for lack of space only been touched on.

Development, physical or mental, is essentially an interaction between heredity and environment. Our need to know the exact facts of development is obvious. Previous studies have stressed the hereditary basis; this work has devoted itself to a better understanding of the influence of environment.

The material bearing on the influence of environment in the development of intelligence has been drawn from many sources, and while not necessarily complete, constitutes, we feel, an adequate summary. This summary has been compiled to be authoritative; it



is organized to present the point of view reached by enlightened research, the data in most cases having been gathered within the last decade. At the risk of losing the reader's interest we have burdened the text every step of the way with references to the original source material, and we urge the interested worker who wishes more detail to consult these sources.

Materials bearing on the interaction of heredity and environment in physical development are scattered, including a vast range of medical literature as well as systematic studies in anatomy, physiology, and genetics. A comprehensive survey of this topic would have required resources and facilities beyond those of the present undertaking, and might have revealed a field as yet too controversial for authoritative review. In any event, this important subject is reserved for a later volume.

A parallel chapter on the influence of environment in the development of personality seemed to be called for; it was one which we would have delighted to supply. But, unfortunately, the factors underlying personality development are as yet so incompletely understood by psychologists, the tools of measurement so inadequate, the research data so meager and insecure, that we did not feel justified in organizing such an analysis. Very different aspects are stressed by different and important groups of psychologists. Factual and experimental material is hardly as yet sufficient to bring any of these varying points of view clearly out of the realm of theory into that of established knowledge. We have felt it better, therefore, to review theories held by different schools of thought on this subject and which are stimulating with respect to future research, rather than to attempt a presentation of the very limited experimental material which is as yet available. We have presented the main points of view, the theories, the various approaches to the study and understanding of personality which have grown up in the fields of psychology and psychiatry; we do not hold a brief for any one "school"; we have not attempted to grapple with the entrancing subject of heredity and personality, and, in our attempt to hold ourselves unbiased, we have offered almost no criticisms or comments on the material offered.

"Heredity and Environment" is thus a reference work on psychological measurement and a summary of studies on the developmental origins of mental characteristics. If the presentation seems to be long, we hope that the reader will find it interesting, as have the author and editor, for the light which modern studies throw on the baffling and ever fascinating problems of human personality.



Perhaps the most important application of findings on heredity and environment lies in the field of population studies, particularly those studies having to do with changes in the quality of our people. It is now possible to obtain quantitative data on the characteristics of population groups and on their respective rates of reproduction, but the interpretation of such studies can be easily perverted by an uncritical use of psychological materials. The findings of this volume constitute a warning against hasty judgment in the field of eugenics and against the subjective treatment which this important topic has received in the past.

It is the hope of the authors that the more objective interpretations made possible by the findings of this book will help students of population to give a coordinated picture of the dynamic changes which are taking place in the characteristics of our people from one generation to another, and which, for good or for ill, are taking place without conscious social control.

A compilation of this sort implies in a large degree a debt of obligation to many individuals and their researches. Special acknowledgment and appreciation is due to Professor Gardner Murphy, of the Department of Psychology, of Columbia University for his kindness in reading and criticising the greater part of the manuscript, and for his many helpful suggestions. Dr. Clark Wissler, Professor of Anthropology at Yale University, and Curator at the American Museum of Natural History, New York, served also as a reader, and his opinion, particularly on the section on twins, was much valued. To Dr. John Levy, of the New York Psychiatric Institute, and Professor of Psychiatry at Columbia University, we are indebted for reading and commenting helpfully on the section dealing with psychiatric viewpoints on personality. Dr. Paul Popenoe, of The Human Betterment Foundation, Los Angeles, and Mrs. Charles Bosanquet, of London, writer and contributor in the field of Eugenics, also read the manuscript and assisted with suggestions.

During its operation the project was housed in the American Museum of Natural History; the facilities of the Psychology Reading Room of Columbia University, were freely used. Especially appreciated in this connection was the gracious and intelligent assistance of Mrs. E. Tunnell, Librarian. Miss Kathleen Harris rendered continued expert service in typing the manuscript and preparing copy for publication.

As to source material, a generous borrowing from many quarters is implicit in a compendium of this kind. Individual acknowledgments to publishers, authors, studies, would be impossible, but our

very great debt to them can be traced through the bibliographic references.

We gratefully acknowledge our indebtedness and thanks to the following publishers, through whose courtesy we are permitted to reproduce illustrations, tabular material and quotations:

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Of special and voluminous assistance has been the *Twenty-seventh* Year Book of the National Society for the Study of Education; also the individual case reports, appearing at times in the *Journal of Heredity*, on identical twins reared apart, prepared by Professor H. J. Muller and Professor H. H. Newman. Professor Newman, of the University of Chicago, very kindly allowed us to use unpublished data on his last three sets of identical twins, reared apart. Dr. Tryon, of the University of California, supplied us with unpublished material and charts in the field of animal experimentation. Dr. Hildreth, of the Lincoln School of Teachers College, Columbia University, and Miss Tallman, of the New York Neurological Institute, placed at our disposal their original records on orphans and twins.

GLADYS C. SCHWESINGER  
FREDERICK OSBORN

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# HEREDITY AND ENVIRONMENT





## INTRODUCTION: TECHNIQUES OF MEASUREMENT

"Until the phenomena of any branch of knowledge have been subjected to measurement and number, it cannot assume the status and dignity of a science."

FRANCIS GALTON.

In very recent years, so recent that it has as yet hardly entered the curricula of school and college, a new science has been taking form—the Science of Man. Centuries ago, astrology was transformed into astronomy, alchemy became chemistry, and in the past hundred years chemistry and physics have transformed the conditions of human life. But until early in the twentieth century the taboos of religion and the fixity of scientific method as then established, discouraged the study of man as a growing, living, and social organism. In the past two decades a reversal of this attitude has taken place, and scientists in ever increasing numbers, and with increasing public sanction, have been developing techniques, delimiting their respective fields of study, and within those fields have been developing a foundation of factual and experimental material from which may come changes not only in the conditions of human life, but also changes in the social and personal characteristics of the individuals who make up human society.

The field with which we are concerned in the present investigation is that which deals with the differences in the characteristics of individual human beings, and with the average differences between various population groups in this country.

In any attempt to study the causes of human differences, methods of measuring man are a pre-requisite, and we must avail ourselves of the important work on human measurement which has recently been carried forward by the psychologists and anthropologists. These measures are still in their infancy, and are in many cases inexact and subject to uncontrolled factors. They were developed for many uses other than those to which we desire to apply them. It seems necessary to appraise their value and present status, as a preliminary to considering the material with which we are more directly concerned. The first two chapters will, therefore, take up the subject of measurement at considerable length under the general headings of Measurement of Intelligence and Measurement of Personality.





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## I. HISTORICAL SKETCH

The first efforts to measure the mental traits of man were made in the second half of the nineteenth century in the pioneer psychological laboratories of Fechner, Wundt and Galton. The Germans, particularly interested in studying general mental laws common to all human beings, became disturbed by individual differences in imagery, reaction time, range of attention, and powers of association of their Subjects. The measurement of reaction time then engaged the attention of Cattell, a student in Wundt's laboratory. The techniques learned in the laboratory of experimental psychology were then applied by psychiatrists—especially Kraepelin—to the study of individual differences of the patients in the clinic. In England, even earlier (1869), Sir Francis Galton (58) \* had set about measuring individual differences in order to discover their laws of inheritance. Galton invented instruments that could discern differences in sensation, but when faced with the problem of testing differences in intelligence he was forced, for lack of objective tools or tests, to fall back on questionnaires and rating scales. Cattell for a time, also, was associated with Galton. No doubt this contact strengthened his interest in research on individual differences. It was Cattell who brought to America the term "mental test." In 1890 he published an article called *Mental Tests and Measurements* (23) in which were described measurements of acuity of sensation, speed of movement, simple judgment, and memory. Very few of those tests could be considered as tests of general intelligence. During the next decade the main advance was along the line of standardizing tests of this sort involving relatively simple mental processes. Progressive interest in mental measurement is reflected in the later work of Bolton (10), Gilbert (68), Ebbinghaus (40), Sharp (147), Seashore (143), Kirkpatrick (98), Bagley (3), Norsworthy (128), and others, who extended the range of mental operations tested to include: rapid calculation, digit span, sentence completion, oral counting, card sorting, interpretation of ink blots, *etc.*

These early tests were characterized in greater or less degree by

\* Numbers in parentheses refer to references listed in the bibliography at the end of each chapter.

several points of approach which have since been found to be largely unsound: (1) That "the mind" can be measured by testing a number of relatively simple sensory motor reactions, *e.g.*, counting dots, canceling letters; (2) that mental life could be analyzed *a priori* into rather distinct mental functions, *e.g.*, memory, imagination, *etc.*, based on the point of view of an older "faculty psychology"; (3) that, even were the existence of such functions as mental entities to be granted, the arbitrary assumption of the test constructor was deemed sufficient to establish the validity of his test as an instrument of measurement of the function considered.

Indeed, almost the only criterion on which these tests depended for their validity were "armchair" analyses of the mental processes which, arbitrarily, were supposed to be measured by the test; that is, each test constructor was guilty of a "naming fallacy," or, in other words, he would decide empirically that his test was a measure of "memory," "reasoning power," "imagination," "perception," and other separate mental functions or processes.

The first powerful objector to the method of trying to measure intelligence by tests of so-called "mental elements" was a French psychologist, Alfred Binet, who held that intelligence is revealed in situations calling for the use of many functions at once, and that *complex mental processes* must be tested, for only in them are variations important enough to differentiate human beings intellectually. Binet decided that the attempt to disentangle intellectual processes into simple component elements was futile as an approach to the measurement of "general intelligence," since it was in their *combined* functioning that the efficiency of the mind should be tested. The concept of "general intelligence" was thus developed as against the concept of separate "mental functions," such as "memory" or "reasoning"; and the tendency to concentrate on simple sensory motor processes was dropped.

However, Binet continued to regard "general intelligence" from the aspect of its various functioning expressions or of the factors behind it. He emphasized particularly "attention" and "adaptation" (used in a wide sense) as factors underlying intelligence. Later he stressed three aspects of intelligent behavior: (a) The ability to take and maintain a given mental set; (b) the capacity to make adaptations for the purpose of attaining a desired end; and (c) the power of auto-criticism, or recognizing and correcting one's own mistakes.

Binet's concept of intelligence was not an *a priori* formulation. He began with an attitude to interchange "intelligence" with "knowl-

edge," an attitude characteristic of popular notions today. Then, after experimenting with tests on children, he realized the essential rôle of "ability" to adjust to problems, to exercise initiative, common sense, judgment; finally, he emerged with the three-fold definition "general intelligence," outlined in the preceding paragraph.

After experimenting over a period of years, from about 1898 to 1905, in the course of his attempt to find tests which would differentiate bright children from dull children, or, in other words, to test this "general intelligence," Binet and his co-worker, Simon, (6, 7) set up two procedures: First, they worked out standards of intelligence by obtaining the opinions of parents, teachers, and friends as to the individual brightness or dullness of a group of children; by systematizing these judgments they obtained our first "criteria of intelligence." Second, they collected lists of questions on everyday topics and simple tasks, all of which they could, *a priori*, assume as being part of a child's experience. These they arranged in groupings according to the experience common to each year of a child's life, beginning with the age of three. After much experimentation Binet established the fact that differences in stages of mental development, as represented by the performance of children at various ages (in response to his tasks and questions) are closely connected with differences in intelligence, as judged by responsible observers.

The modern mental testing movement may be said to have sprung from those two ideas: That instead of checking against empirical assumptions, objective criteria of general intelligence must be employed; and that all individuals, classified by a standardized test with reference to a group, must have shared a background of common experience, such as obtains in the home, the school, and other cultural media. These ideas spread rapidly. By 1912 there were three revisions of the Binet-Simon scale in Europe, and three in America: Binet (8), Bobertag (9), Decroly and Degand (33), Goddard (70), and Terman and Childs (175). Since then, no less than sixty-eight revisions of the Binet scale have been reported by Hildreth (83).

The yearly increment scale gave rise to the concept of "Mental Age," namely, the age at which a certain portion—usually about seventy-five per cent—of the children on whom the test was standardized can first complete a given task or set of tasks. (169) Hence the intelligence of an individual can be gauged by comparing his responses with standards of performance for normal children of his own and of different ages. Upon this basis of mental age in relation



to life age was derived the "Intelligence Quotient" or "I.Q.," first proposed by Stern (164) of Germany. The I.Q. is not a score in terms of tasks done, but a ratio between a child's actual performance expressed in terms of his "Mental Age," or "M.A." and his own chronological age, or "C.A." Thus it will be seen that the I.Q., always being a ratio between two expanding variables, does not necessarily change or fluctuate from year to year.\*

Once the mental test was launched in America, especially in Terman's publication (169) of the Stanford Revision of the Binet-Simon scale in 1916, it was widely employed, particularly in institutions for the feeble-minded, immigrant receiving-stations, child study clinics, and most of all in the public schools. Mental testing received a pronounced impetus later, when in war-time the government asked a group of psychologists to construct scales to measure the intelligence of adults assembled in groups. The result was the construction of the Army tests: "Alpha," a verbal test for the literate, and "Beta," a non-verbal test for the illiterate. Full accounts of this work are to be found in the publications of Yoakum and Yerkes (200), Army Memoirs (199), Brigham (13), and others. These army tests and their later revisions and modifications gained widespread use. In addition, more and more performance and other non-language tests appeared. Healy and Fernald (77) in 1911 had been the first to offer such tests especially to clinics. Performance tests, for the most part, consist of such manual problems as fitting blocks into appropriate grooves in boards, reconstructing puzzles, completing pictures, threading pencil and paper mazes, and the like.

In the 1920's, verbal group tests appeared by the dozens, mostly for use in schools and industrial establishments; and not all of these tests were constructed or standardized with adequate care. Tests were soon administered by the expert and the inexpert alike. High hopes were set, especially by the unenlightened, on the efficacy of the "I.Q." to solve educational and personal problems. Premature claims, in turn, stirred up fiery opposition, led by such laymen as Lippmann (109), (172), (194).

At present, the mental testing movement can be said to be slowly recovering from the false impetus it received from misinter-

\* For example, if a child who is three years and nine months old has a mental age of four years, his I.Q. will be 107; if at the age of seven years and two months his mental age is seven years and ten months, his I.Q. will still be 107, a little better than the "average I.Q." of 100. The problem of the "constancy of the I.Q." has stirred up considerable controversy and experimentation, and will be discussed later. (See pp. 51 ff and Chap. IV.)

pretations of the army results and the enthusiasm of misguided users of test materials. Unqualified assertions about the I. Q. are becoming rarer; it is more and more recognized that the influence of different backgrounds, social and educational forces, and other such factors, must be taken into account. The most hopeful signs for the future are a constantly increasing caution and a statistically painstaking care in the construction and validation of new tests; a new insight into the matter of interpreting scores, coupled with a general lack of confidence or a canniness in not accepting any "standardized test" merely because it has worked its way into print and been offered for sale.

Researches conducted at the Institute of Educational Research of Teachers College, Columbia University, under Professor Thorndike; in the Department of Psychology at Princeton University, under Professor Brigham; in Stanford University, under Professors Terman, *et al*; in the Harvard Graduate School of Education, under Professors Dearborn and Kelley; in the University of Minnesota, under Professor Paterson and his co-workers; in the University of London, under Professor Burt (formerly under Professor Spearman) will be followed with keen interest for even more recent trends in the nature and measurement of intelligence. And for improvement in instruments for the measurement of the "lower levels of intelligence" including infants, toddlers, and other preschool groups, we look to the many excellent university centers of child welfare research, all established within the last decade: such as those of Yale, under Gesell; Minnesota, under J. E. Anderson (and Goodenough); Columbia, under Meek; Toronto, under Blatz; Berkeley, under Jones; and the Merrill-Palmer School, under the direction of E. N. White. The last named, a private institution in Detroit, has been a most active center in study of the early ages.

## II. THE NATURE OF INTELLIGENCE

### A. UNDERLYING CONCEPTIONS

The geneticist or the sociologist who wishes eventually to measure "innate ability" must be in touch with intelligence theory. Especially must he be acquainted with the controversy as to whether intelligence is "general" or "specialized," since this has a vital bearing on his researches into mental heredity. Even though mental tests may have proved useful in the measurement of "general intelligence" it does not necessarily follow that they can accurately

measure "mental traits" as the units through which the laws of heredity would operate (198). The question of the "uniqueness of traits" will be discussed later. (pp. 13 and 97 ff) Before considering intelligence from an analytical point of view, we shall examine some of the attempts of distinguished psychologists to define it. Among well-known definitions are the following:

1. Stern (163) defines intelligence from a teleological point of view:

"Intelligence is a general capacity of an individual consciously to adjust his thinking to new requirements: it is general mental adaptability to new problems and conditions of life." (p. 3)

2. Peterson (132), taking note of its neurological basis defines

". . . intelligence as a biological mechanism by which diverse impulses are brought together and given a somewhat unified and consistent effect in behavior. These impulses are, of course, the results of stimuli of various kinds—interoceptive, proprioceptive, and exteroceptive—both simultaneous and successive, direct and indirect." (pp. 283-4)

3. Freeman (51) recognizes that individual differences in

". . . degrees of intelligence are determined by the general capacity of the psycho-physical organism for the formation of new patterns among the elements of experience." (p. 491)

In a later expression Freeman (52) holds that psychologists have incorporated into their concept of intelligence the notion of "innate ability," because earlier students noticed that the I. Q. remained relatively constant on repeated tests. He feels as a result of his own researches (to be reported later, Chapter IV) and a survey of other evidence that intelligence is modifiable, and that it should be our effort to provide for all possibility of improvement through education and experience.

4. Pintner (134) offers an admittedly empirical view:

"Intelligence . . . signifies a judgment on the part of someone with reference to a specific response. The criterion as to whether the individual attains the end he is striving for is necessary for our judgments of intelligence. There are no specific kinds of reactions that are peculiarly intelligence reactions. . . . We may judge intelligence from habitual modes of reaction just as well as from reactions to novel situations . . . to use a standardized test as a test of intelligence, we must make sure in the first place that the individual being tested has roughly the same background as that of the children used in the standardization of the test. (p. 609) \*

\* From Pintner, R. An empirical view of intelligence. *J. Ed. Psychol.*, 1926, 17.



For other definitions, the reader is referred to Binet and Simon (7); Woodworth (198); Spearman (158); Colvin (28); Meumann (123); Witmer (195); Kirkpatrick (97); Burt (21); F. L. Wells (191); Thorndike (179) (181); and Terman (180).

Some workers, for example, Ballard (4), Young (201), and Dodd (37), confine their concepts of intelligence to something which is "measurable." The contributions to our knowledge of the growth and development of intelligence, made by Terman, Thorndike, Pintner, and many other workers with tests, have been made on the assumption that individual differences in innate intelligence can be ascertained by scores on intelligence tests.

Summarizing the various points of view brought out in definitions of intelligence, we note that the aspects which seem to have called forth most comment from psychologists are: Ability to think in the abstract, particularly to see relations; ability to act in accordance with such insight, which means the suppression of reactions leading away from the end in view, and the furtherance of reactions which would maintain the direction toward that end. In complex situations this "power of adjustment" or "mental adaptation" would call for new behavior patterns in different modes, as the end in view and the situation require. It calls for ability to be on the alert for new situation elements (curiosity); to recognize a need to change old patterns (auto-criticism); for capacity to retain the old patterns (learning, memory) which are to be redirected for production of new patterns (creativeness). It calls for power and speed in effecting the desirable reactions, so that new errors and difficulties may not be introduced. It is on such mental processes as these that intelligence test constructors build their tests. Accumulated evidence from test data suggests that the field in which the mental process functions is not so important; it may be verbal, material, animate or inanimate, but obviously, the more complex the elements in the situation presenting the problem the greater the degree of intelligence required to solve it.

It has seemed best, in the pages which follow, to use the term "test intelligence" to describe the characteristic measured by existing psychological tests.

Definitions, such as those given above, express the practical views of different psychologists as to what distinguishes bright people from dull. Such definitions do not seek to explain the *nature* of general intelligence and its relation to the different traits of the individual. The "nature" of intelligence, like the definition of intelligence, was at first subject to general debate; but more recently

has been attacked by the method of careful analysis of test scores. Two outstanding theories have been advanced to explain the nature of intelligence: Thorndike (176), in 1903, stated as his view that there was no such thing as "general intelligence"; but rather that there were many special and unrelated intelligences and skills. Spearman (157), on the other hand, held that two factors underlie intelligence,—the one, a general ability or common fund of intellectual energy; the other, a series of specific skills or abilities, such as mathematical or language ability.

Thorndike's viewpoint is known as the "Synthetic Theory" because it holds that, in general, intelligence consists of distinct elements, variously interrelated; while Spearman's is called the "Two Factor Theory" because it postulates a central fund of "general ability" besides unrelated "special abilities." In 1914 Thorndike explained the high correlation found between different abilities by the fact that these abilities contain "common elements." (177) Spearman, as early as 1904 (157), held that the factor, "g", or general ability, explains the inter-correlation of mental traits.

"All branches of intellectual activity have in common one fundamental function (or group of functions) whereas the remaining or specific elements of the activity seem in every case to be wholly different from that in all the others." (p. 284)

Many investigators find this last theory adequately supported by their facts, while others attack it. One of its ablest critics is Truman L. Kelley (93), who considers that "g" is not the same throughout, being sometimes verbal, sometimes a "memory" factor, sometimes "speed." Kelley feels that his work points to a "multiple factor" rather than a single factor hypothesis—that this variation in "g" is due to heterogeneity of race, sex, maturity, and so on.

"With reference to a designated set of measurements, through all of which runs a certain factor, A; through several of which runs a factor, B; and in one of which is a factor, C, the writer sees a value in the terms general, group, and specific, but this value is only in the descriptive power of these terms for the particular situation which is being investigated. Given other tests, the A factor might become specific, the B factor become general, and the C factor become a group factor. To determine factors which are not thus dependent upon a particular set of tests, it is necessary to utilize many measures at once, thus making a very exhaustive survey of the mental ability of the Subjects tested." (pp. 21-2)\*

\* From Kelley, T. L. *Crossroads in the mind of man*. Stanford Univ. Press. 1928.

Recently, certain workers have found "groups" of abilities, such as comprehension, memory, intellect with words, numbers or symbols, mechanical abilities which are made up of primary functions held together by such "bonds" as a "verbal factor," a "numerical factor," a "directions attitude," a "reading attitude," a "music factor," *etc.* These "group factors" cannot all be measured in the same dimension; some, for instance, must be tested for strength, others for speed, others for range, and so on.\*

Kelley's (93) own investigations, while primarily devoted to devising techniques of analysis for unitary traits, suggest as group factors certain specific aspects of intelligence, namely, manipulation of spatial relationships, facility with numbers, facility with verbal materials, memory, mental speed, and certain other less clearly defined traits which may be statistically isolated within the area of "general intelligence." Spearman (157) lists as special ability factors: 1, some form of memorizing; 2, certain forms of fatigue; 3, musical ability; 4, logical relations; 5, arithmetical relations; 6, mechanical relations; 7, psychological relations. Once the unitary traits are established, the geneticist will be able to study the inheritance of mental "traits" of individuals, even though "traits" which are found by statistical analysis to be "unique" do not conform to our earlier logical conception of "types" of central nervous activity, such as reasoning, imagination, and so on.

Work is being done steadily by Kelley, Spearman, and others, in discovering such entities which "hang together" statistically. Kelley (93, p. 123) offers a formula for interested workers. To designate a mental trait as such, means that it must be measurable, either "in the same individual at different times, or in different individuals at any time." (93, p. 3)

Research on the analysis of intelligence has been reported also by Schneck (141) and by Garrett (60), both of whom find that "verbal ability" and "number ability" are independently varying traits, especially so for young children. Garrett thinks that in the upper levels factors other than verbal ability "operate with sufficient strength to permit differentiation and to render doubtful the meaning and value of a total or composite score." (p. 108)

This problem of mental organization has engaged the attention of several of Garrett's students, among whom may be mentioned Anastasi (2), Peatman (131), and Dubois (139). These workers

\* Brigham (14) states that if independent groups of traits exist, then the scores of tests in which verbal and mathematical materials, for instance, are indiscriminately mingled, cannot be valid. Such procedure, he holds, would be akin to "adding apples and oranges."



have isolated the three group factors of: memory, scholastic aptitude, and mental speed, respectively. Kelley is insistent that the first task is to find as many as possible of these uncorrelated mental traits, and that these be separately measured before satisfactory progress can be made in studying mental inheritance. This does not necessarily ascribe to the view that intelligence is a "summation" rather than an "integration" of traits. Kelley (93) is led to

"... emphasize the variety of mental activity of which man is master and to outline a picture of mental life which future study will fill in. In brief, the boundaries of mental traits are ruts, not far-flung indefinite fringes of consciousness. Mental life does not operate in a plain but in a network of canals. Though each canal may have indefinite limits in length and depth, it does not in width; though each mental trait may grow and become more and more subtle, it does not lose its character and discreteness from other traits." (p. 23)\*

Kelley's own contributions consist more of specific techniques and procedures for the isolation of these mental traits or types than in any claim to specific experimental findings, although mention has already been made of beginnings in this exploratory attempt. (See page 13)

The matter of definition of terms is highly important, particularly when inferences from any study of mental measurements are drawn. Workers should have clearly in mind the particular trait, category, characteristic, process, function, behavior on a certain test, or what not, that is being considered. Many distorted inter-research conceptions have arisen because of lack of agreement as to what is covered or connoted by a certain term, so that it would seem more important to consider not how inclusive a term can be but how restrictive. Then, and only then, can workers amalgamate their findings with the confidence that they are each referring to the same thing. Preliminary attempts to standardize psychological terminology have already been organized by such workers as English (41), and Warren and Carmichael (189). As stated on page 11, the terms "intelligence," "general intelligence," "mental ability," etc. (as used by the different experimenters whose researches we report in this book), are restricted in meaning to "intelligence as measured by test."

It is recognized that mental ability grows from almost none at all at birth to a very great deal in adolescence; that it cannot function without a medium in which to develop, and that a certain minimum or "common" environmental milieu (nutritional, educational,

\* From Kelley, T. L. *Crossroads in the mind of man*. Stanford Univ. Press. 1928.

social, *etc.*) can be presupposed for all citizens within a certain community of one homogeneous culture; that individuals differ in their ability to profit from this medium, and that, whereas some individuals may have had a great deal of opportunity and mental stimulation, others may have had relatively little beyond this fundamental "minimum," yet in their responses to test questions, the highly advantaged individuals may do no better; indeed, they may score even lower than the disadvantaged ones. It is, therefore, held by psychologists, in comparing people of similar age, and relatively similar environments and opportunities, that differences in test reaction may be attributed to differences in native ability.

Very little will be said here about the physiological basis of intelligence. In general three main theories have been advanced: (1) That the degree of mental ability depends upon the number and arrangement of nerve cells in the cerebral cortex; (2) that it depends upon the readiness of connections in the synapse; and, more recently, (3) that this readiness is, in turn, dependent upon the stimulating effect of certain endocrine secretions, such as pituitary, thyroid, adrenal. To date these theories are more in the nature of speculative hypotheses than of established fact; they are, however, suggestive of a close relation between mental and physical mechanism, and further researches in this field should hold especial interest for the student of mental heredity.

## B. GROWTH OF INTELLIGENCE

At birth children may be regarded as having almost no intelligence, but varying as to potentialities for its development. Development suggests growth, both of structure and function. At the early age levels mental and physical growth seem to be rather closely correlated. Of especial interest in this connection is the work of Gesell (63, 64) who stresses the general parallelism of muscular development with rise and growth of mental function. Gesell has established certain monthly developmental norms of behavior which can be used as a scale of measurement in both the mental and the physical field. Unfortunately, the details of Gesell's "standardization" are not stated; equally vague is his information on how much these infants varied at each age level.

Gesell notes that at birth the child is capable of random arm, leg, or head movements; a few elementary reflexes; and almost no coördination.\*

\* Of much interest in this connection is the experimental work, recently reported by Chaney and McGraw (26), who find that newborn infants, properly supported, are capable of rhythmic stepping movements.

In a short time he is seen to observe people and things—a mental trait. At the age of one month a child regards his mother's face, but with less intentness than at two months. At two months motor adjustment to being lifted is more pronounced than at one month, and compensatory movements to a shift in position are set up. At three months the baby makes no movements to reach the table edge, but the four-months-old infant shows definite hand reactions, and so on. At nine months he stands with support; at eleven months he can push around a basket which he holds. Gesell (63) writes:

“‘Norms of development’ may be regarded as an effort to catch or characterize certain fundamental entities which underlie human growth.” (p. 125)

The two-year-old is capable of many more manipulative reactions than is the infant; already speech habits and some elements of self-control (inhibition of instinctive activities) have been learned. Increments in mental and motor powers are obvious and can be observed from year to year until about adolescence, when it becomes harder to distinguish, by their behavior, one age level from its neighbor. At about age sixteen to twenty or so mental growth (ability to learn) seems to cease, just as growth in stature ceases. This does not mean that knowledge is stationary, but the power to acquire certain habits, manipulative or ideational, does not seem to increase through subsequent age levels. The individual of twenty is no less able than the individual of twenty-five or thirty to learn certain tasks, think out abstractions, or carry on any of the other mental operations subsumed under the term “intelligence.”

Contrary to popular assumption, this capacity to learn may not decline with increasing age. Thorndike (182) has shown in recent experiments that if learning declines among middle-aged and older folk (except the very old) it is for other reasons than sheer age capacity or incapacity to learn,—reasons such as lack of desire to learn, lack of interest, lowered energy, slower reactive powers, use of bad methods, or an inability to learn which has always been present regardless of age. Jones, as reported by Thorndike (182), found a sharp drop in ability to score on tests after the age of forty-five. This, too, may be attributed to loss of speed, as well as to lessened interest and energy.

Miles (123-a) who is, at present, carrying on extensive researches on age and ability, finds that decline varies with different abilities, those which are nearest the physiological level (*e.g.* sen-



sory capacity) showing the earliest drop. The higher mental functions reach their acme at a later age. Complex mental activities such as interpreting ideas, generalizing, and other abstract processes, which do not require motor adjustments, particularly speed, show strong holding power, "exhibiting almost complete evenness throughout the full range from young adulthood to the last period of old age." (p. 119)

The absolute level of mental ability, then, grows and develops by noticeable increments from birth up to about the middle or late teens, after which it remains relatively steady until middle age, when a gradual decline sets in, with a marked drop in old age for many individuals. The peak or age of greatest ability to learn doubtless varies for different individuals, the duller reaching their fullest possible limits earlier than the brighter. Thorndike estimates that the intelligent have a two year advantage over the less intelligent. The literature on adult learning has recently been reviewed by Ruch. (138-a)

During the childhood ages (*i.e.*, up to about the age of eighteen or twenty), growth units are recognized by arbitrary points along the scale of absolute intelligence and are referred to as so many years and months of "mental age."

#### C. MATURATION RATES FOR DIFFERENT FUNCTIONS

The concept of the growth of "general intelligence," as opposed to the differential growth rates of separate mental and motor processes which express intelligence, is beginning to draw the attention of research workers. Shirley (149-151) has studied the order of appearance of various activities involving motor and psycho-motor coördination in the infant, tracing the development from birth to two years. She finds that it is out of generalized, undirected coördinations already manifested in embryonic life that later reflexes are differentiated or "individuated." Other studies have shown that motor nerves contact with muscles before sensory nerves do; hence reaction mechanisms are ready to respond when sensory excitation gets through. This is significant evidence for the maturationist. Shirley's data on the existence of an orderly sequence of development is equally significant, especially if the sequence should be found to be maintained among different infants in varying environments.

A motor sequence was worked out for infant development beginning with "eye coördination and head control"; in succession upper trunk, arms, hands, lower trunk, legs, and feet came under

control. Eye coördination went through five substages: fleeting pursuit movements, fixation on person or object, and eye following a moving object first in the horizontal, then in the vertical, and finally in the circular directions. Simultaneously with these last two stages of eye movements came the social smile and chest-lifting in the prone position. Reaching, touching, and grasping objects came next in order; control of the upper trunk was further manifested by the babies' ability to sit on the experimenter's lap with support at lower ribs only. Retention of an object with thumb opposition and carrying object to mouth indicated that arm and hand had come under control. With the appearance of rolling and sitting alone, motor control had extended down to the sacral region; and with the use of the index finger for pointing, which occurred some weeks later, it had advanced to the finger tips. (149)

"When sitting alone was an accomplished fact progress toward creeping began in earnest; rolling gave way to swimming, pivoting, or crawling on the belly, and they in turn to scooting backward and then to creeping. Attempts to assume the upright posture began with the babies' standing firmly when supported at the armpits; this act was interpolated into the sequence just before the babies sat alone. Standing with support of a chair came just before creeping; walking when led was simultaneous with creeping; and pulling to the standing posture from a seat on the floor in front of a chair was manifested by the babies just after creeping. A long gap intervened between this act and that of standing alone, an act that was shortly followed by walking alone." (p. 521)\*

The impressiveness of the above sequence of development lies in its consistency, in its few exceptions. Since the time interval between the appearance of the above motor abilities is short, the infrequency of reversals of order (about twelve per cent) is remarkable. Other sequences involving speech development, social development, "intelligence," or, as Shirley calls it, "seeing the point," have been studied. (151) Individual differences in age of development, in "maturation rate" of the above, and other functions of course obtain; it is in a study of these differential rates that material of importance to the eugenicist will lie. If the date of appearance of different functions can be predicted for known groups of individuals under different conditions, such as the restrictions on German babies of 1870, swaddled in long dresses, and the freedom of California babies of 1930, stripped to sun-suits, then obviously the fact of maturation is inherent in the inner organism of the

\* From Shirley, M. M. The sequential method for the study of maturing behavior patterns. *Psychol. Rev.*, 1931, 38.

# THE MOTOR SEQUENCE

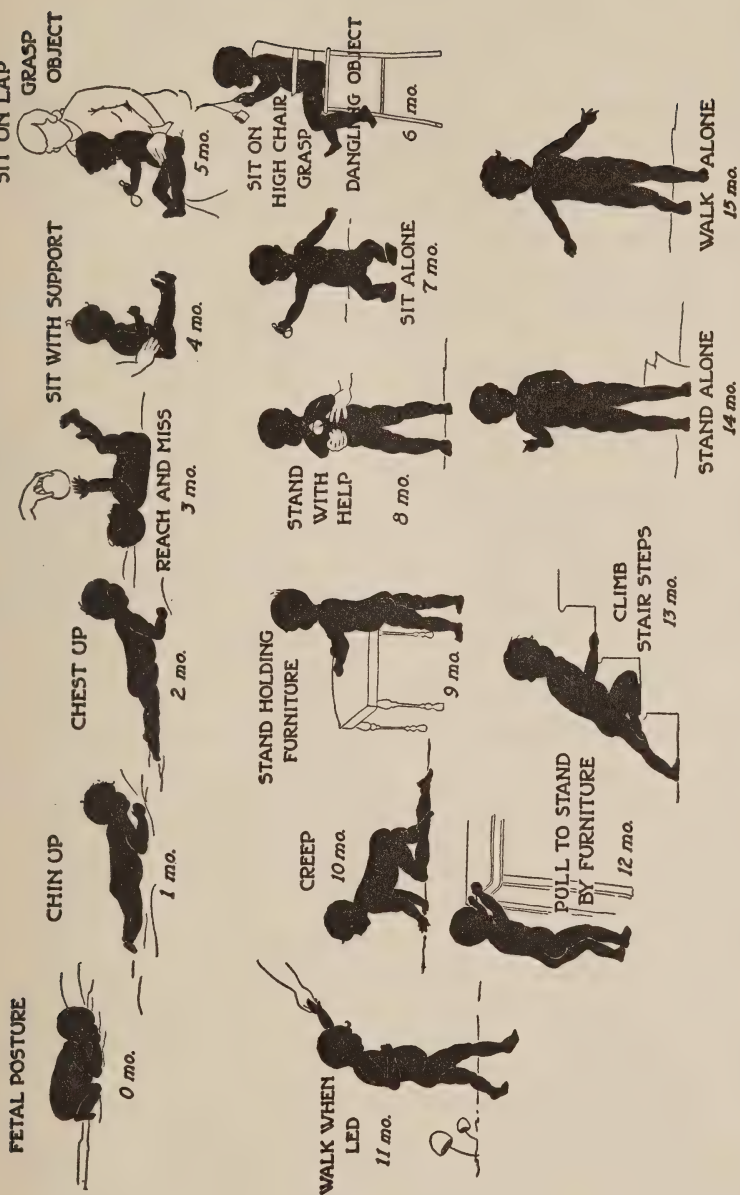


FIG. 1. THE MOTOR SEQUENCE. From M. M. Shirley, *The First Year of Life*, Vol. II, *Intellectual Development*, 1933. Courtesy of the University of Minnesota Press.



individual. Variations in rate of development will give a better clue to innate individual differences than we have had to date.

Studies of sequences deal chiefly with first appearances of skills. Differential growth rates of various functions at higher age levels is being studied by Greene (75), who has established age norms for tapping, aiming, maze solution, and "feature discrimination." His findings on maturation rates of these several functions may be more significant to the eugenist than when such functional differences are submerged in studies of the growth and development of "general intelligence."

### III. THE NATURE OF PRESENT-DAY MENTAL TESTS

#### A. BASIS OF TESTS

The intelligence test is a composite of certain tasks, selected from the background of experience to which all children, to be tested by this instrument, have been exposed. We note how well the child does on such a test, and give him a score or rating. This rating is then compared with ratings made by a large body of children who have had a similar background. We can then say that the Subject's intelligence (on that test) is better, or worse, or equal to the average; to the top ten per cent; to the bottom ten per cent; or to any other arbitrarily selected unit of distance, so long as the scores made by the "standardization group" of children are used as a basis of comparison.

This method presupposes a common background of experience among the children to be compared, such "constant" factors to include: a common language, similar schooling opportunities, approximately similar cultural advantages at home, and so on. For children of different languages, a non-language test is given; for children who have never attended school, or its equivalent, no school subject matter should be included; for children whose social status is obviously poorer or at least different from the average American home, whose "advantages" are less (*e.g.*, the Negro), it is claimed that certain tests standardized on white children are "unfair." Hence it follows that a test must be wisely selected to match the background of the child if dependable results are desired. Tests standardized in one cultural medium cannot be transferred and applied to children, growing, or having grown up, in a different culture. More and more it is being recognized that each homogeneous group should develop its own standardizations, and that an

individual's rating obtained on any standardized instrument should be compared against ratings of his own group.

A striking example of the unsuitability of using a test standardized in one medium, and applying it to children reared in a different setting, is to be found in Gordon's (73) investigation of the intelligence of Gypsy and Canal Boat children. The Gypsy children attended school thirty-five per cent of their time; the latter only five per cent. The tendency was for both groups to test lower than did normal elementary school children who average eighty-eight per cent of school attendance; the average I. Q. of the Gypsies was higher than the average I. Q. of the Canal Boat children, and there was a tendency for the older children in both groups to have lower I. Q.'s than the younger members.

These measurements were made by the use of the Binet-Simon scale, our most reliable test when applied to children who have shared in the kind of experience in which the standardization children have shared. The results on Gypsy and Canal Boat children were startling but effective in driving home the consciousness that tests are not equally valid in dissimilar environments; that, instead of engaging in controversy as to whether the I. Q. is a direct result of schooling, the Binet test (since it is rather heavily loaded with school matter in the middle ranges) must be given only to Subjects who have had adequate school experience. (See pages 284 ff.)

## B. FACTORS WHICH INFLUENCE TEST SCORES

Obviously, also, to obtain an impersonal and fair rating, it is pre-supposed that the Subject comes to the test naïve to the test situation and untutored in the test content. Too many test appointments tend to make the Subject sophisticated in the matter of test taking, or, in technical parlance, he becomes "test wise" and has a slight advantage over the Subject who is quite unfamiliar with test procedure. On the other hand, this general sophistication is not nearly so great a help as is definite previous experience in the particular test taken; this kind of experience is described by the term "practice effect." The difference between temporary and permanent practice effect is an important matter. Still greater assistance, and to so serious a degree that it would invalidate the rating, can be obtained through "coaching." (27, 74, 122, 154) The more general problem of the influence of general improved environment, including such factors as schooling, cultural level of family and home background, physical condition, and the like, in raising or lowering the I. Q., will be discussed in a later chapter.

(See pp. 247-340) Here we are concerned more with factors *inherent in the test situation*.

Certain factors which tend to influence the intelligence rating adversely are especially urged for consideration. Such factors include language handicap (179), and lack of coöperation on the part of the Subject, due perhaps more to a psychopathic condition (for example, catatonic dementia præcox) than to willful unwillingness. (142, 192) It is frequently urged that temperamental factors interfere with success on tests among normal individuals; that Subjects become "nervous" and thereby lower their score for intelligence. Studies have been published on the influence of this emotional factor (76, 89, 113, 142, 154, 202), and the evidence (except for very young children or for psychopathic subjects) is largely negative. Some exception, too, may be made for children in remote rural districts, unaccustomed to strangers.

However, all instructors charged with the training of mental examiners, stress the importance of not administering the test while the Subject is emotionally disturbed, and also of observing and allowing for possible emotionally interfering factors in the test situation. Psychologists still faithfully report on "attitude," "rapport," and other emotional and volitional aspects for each clinical case studied, but many of them are ready to agree that only in the very rare case is failure due to lack of coöperation. Children above preschool ages are generally ready and eager to take tests, and even when under severe emotional stress, as, for instance, in the case of court commitments, they are usually found to put forth maximum efforts to strive for a high score.

### C. VERBAL TESTS OF GENERAL INTELLIGENCE

#### *i. Group Tests*

A group test is one which can be given to more than one person at a sitting. The maximum size of the group depends to some extent on the nature of the Subject components of the group, varying, for instance, from a half dozen or more kindergartners who will require close supervisory help, to a hundred or more adults who can be set independently to work after a few preliminary instructions have been given. Tests of the latter sort are practically "self-administering."

The chief advantages of group testing are the economy of time and administrative labor, and the possibility of securing many more Subjects than could be reached by individual testing. Many group



tests, although given by trained Examiners, can be scored by high grade clerks under expert supervision. This serves materially to lessen the cost of testing.

Group tests assume that each individual taking the test will do his best, particularly because of the competition with others, which characterizes the group test situation. Often these tests stress the factor of speed, giving barely enough time for even the brightest in the group to accomplish the task set. Sometimes the test elements are arranged in the order of difficulty, progressing from very easy to very difficult. These "power" tests are not so likely to stress speed, because the Subject meets his own limits often before time is called. The relation of speed to intelligence in general has been discussed by many workers. For details the reader is referred to Peak and Boring (130), Sisk (153), Kennedy (96), McFarland (117), and to a recent review of the literature by Beck. (4-a) A fundamental principle of test construction is that tests should contain certain elements easy enough for even the least intelligent to accomplish accurately, and some elements hard enough for the brightest to fail on, assuming that if it were not so arranged, his full power would not be tested.

Within the last ten years a good many group tests \* have appeared, some measuring very limited phases of mental behavior, such as skill in recognizing forms or doing arithmetical problems, others embracing wider aims.

Some of the sub-test items commonly met with, especially in the earlier group tests, include the following:

1. "Completion of Complex Forms" devised by Ebbinghaus in 1897. This test, according to Terman and Childs (175), "requires the Subject to relate given fragments" (usually of a sentence, sometimes of pictures) "into a meaningful whole." It is so highly thought of that Colvin (28) called it "the most important intelligence test contributed by psychologists for determining individual differences."

\* A few of the better-known group tests may be mentioned by name: Pintner-Cunningham Primary Mental Test (World Book Co.); National Intelligence Tests: Scales A and B, Grades III to VIII (World Book Co.); Dearborn Group Intelligence Tests: Series I for Grades I to III, Series II for Grades IV to IX (Lippincott); Otis Self-Administering Tests of Mental Ability: Intermediate Examination for Grades IV to IX, Higher Examination for Grades IX to Adult (World Book Co.); Multi-Mental Scale for Grades III to VIII (T. C. Bur. of Publ., Columbia University); Terman Group Tests of Mental Ability for Grades VII to XII (World Book Co.); Army Group Intelligence Examination: Alpha, for Upper Elementary Grades Through Adult Level (Stoelting); Thorndike Intelligence Examination for College Entrance, for High School Graduates (T. C. Bur. of Publ., Columbia Univ.); Roback Tests for Superior Adults (Stoelting).

2. In the "Analogies" test the Examinee is given a series of three words or pictures to which he must add a fourth, bearing the same relation to the third as the second does to the first. Analogies can be classified as associations of the part with the whole (*e.g.*, hand : arm :: foot : ?); genus with species (*e.g.*, animal : cow :: plant : ?); cause with effect (blow : anger :: poison : ?); and similarities with differences (day : night :: white : ?).



FIG. 2. MISSING ELEMENTS.



FIG. 3. INCONGRUENT ELEMENTS.

*From G. T. Meyers. Courtesy of Newson & Co.*

3. In the "Absurdities" test, the Subject is required to isolate irrational elements in sentences or pictures, or to detect missing parts.

4. The "Mazes" are usually pictorial labyrinths which must be traced through with a pencil to a goal.

5. The "Substitution" or "Digit-Symbol" test involves learning to connect or associate one set of characters with another, usually numbers with letters, or numbers with symbols, or letters with symbols, according to a Key, as set down at the top of the page.

6. The "Cube Analysis" test calls for a certain visual imagery. The Subject must count mentally the exact number of cubes in a picture or model of piled cubes.

7. The "Number Series Completion" test requires the Subject to perceive a rhythmic principle underlying a set of numbers and

then to continue the progression, *e.g.*, 3, 5, 7, 9, . . . *etc.* Similarly, part of a rhythmic design is often presented for continuation.

Other tests include: "Rote Memory Span," or the ability to reproduce an increasing series of numbers exposed to the Subject,

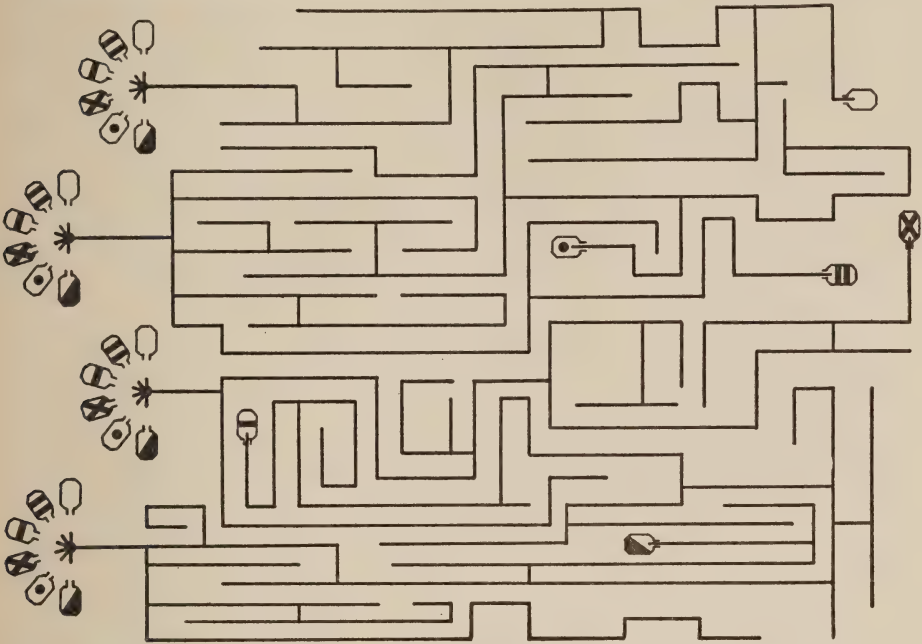


FIG. 4. MAZE TEST. From S. C. Dodd. Courtesy of C. C. Brigham.

either visually or orally; "Vocabulary," or the ability to know the meaning of, and to use words of varying degrees of difficulty; "Directions," from relatively simple to complex, which must be

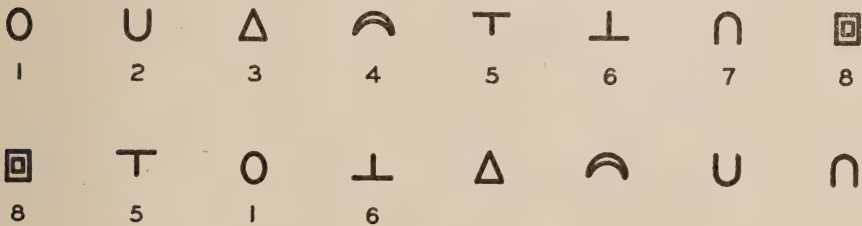


FIG. 5. DIGIT-SYMBOL TEST.

executed by the Subject, (*e.g.*, "Write the letter which is second to the right of the letter that comes after O."); "Reading Tests," in which comprehension of material read is usually tested by the Subject's accuracy in answering carefully framed questions in re-



gard to the text; "Interpretation of Proverbs," which is self-explanatory; and "General Information" which taps the Subject's general range of interests and alertness in widely different fields, from familiarity with the names of popular movie stars to knowledge of

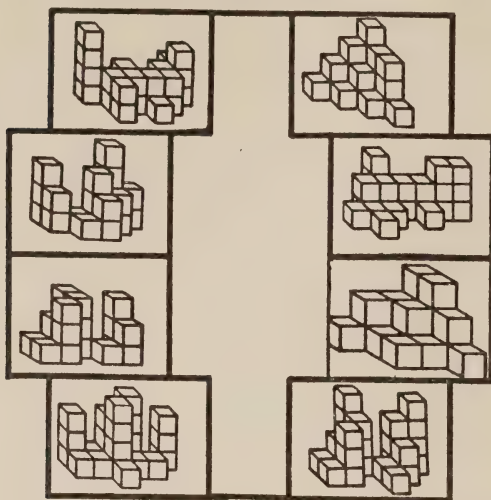


FIG. 6. CUBE ANALYSIS. *From S. C. Dodd. Courtesy of C. C. Brigham.*

facts and principles which would catch the attention of followers of Einstein. Many other devices have been used as content for group intelligence tests, but the above will serve to illustrate the general nature of the material.

#### Scores

Scores on the sub-tests or items in intelligence tests are usually added to make a simple total, although at times some one or more sub-tests may be weighted so that their score will not occupy too prominent a place in the total. Final or total scores are usually converted into mental age or grade norms, or into some other equivalent, by reference to a table. This table has been computed by the test constructor who has determined the average total score which children of each age or grade make, on the average, when

/	/	-	/	-	/	/	-	/	-		
-	/	=	/	-	-	/	=	/	-		

FIG. 7. SERIES COMPLETION. *From G. T. Meyers. Courtesy of Newson & Co.*

taking the particular test. The test is usually contained in one printed booklet and offered to children of two or three age and grade ranges, thus being relatively harder for the younger children and easier for the older children within any given group. Tests are generally received by children with enthusiasm.

The Kuhlmann-Anderson Test \*

The Kuhlmann-Anderson Test, (101-103), rather widely used, comes in separate booklets for different age levels; it requires from thirty to forty minutes to give, and can be scored by a good clerk, under supervision.

A few of the sub-tests on the Kuhlmann-Anderson scale at different levels will be sufficient to illustrate the content of the series:

GRADE III

Test 14. (First test for age nine)

Examples:

The directions explicitly stated, involve the problem of finishing the last of the line just like the first of the line.

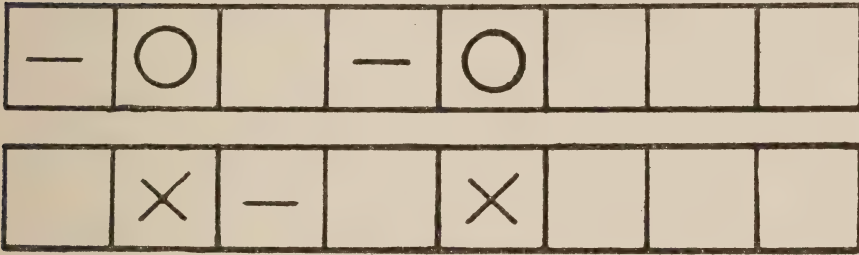


FIG. 8. SERIES COMPLETION.

Test 17.

Examples:

1. Which of these is the longest? A foot, a yard, an inch?
2. Which of these is the heaviest? A cup of flour, sand, water?

The problem is to underline the word which supplies the correct answer to the question to which it is attached.

Test 18. (Third test for age nine)

Examples:

1. N M A
2. L A B L
3. B Y A B

The problem here is to change the letters around in their right order so as to make a true and sensible word.

\*These illustrations and excerpts are reproduced by courtesy of Educational Test Bureau, Inc., Minneapolis-Philadelphia.

## GRADE IV

Test 21. (First test for age twelve)

Examples:

1. Free, good, old, heavy, bad, fast

2. Like, fun, friend, cousin, enemy, skate

The problem is to recognize and underline the two words which are opposites.

Test 22. (Last test for age nine)

Examples:

Bread, meat, eggs, plate, cheese

free, happy, glad, joyous, pleased

The problem is to cross out the one word in each list which does not belong with the others.

Test 24. (Last test for age eight)

Examples:

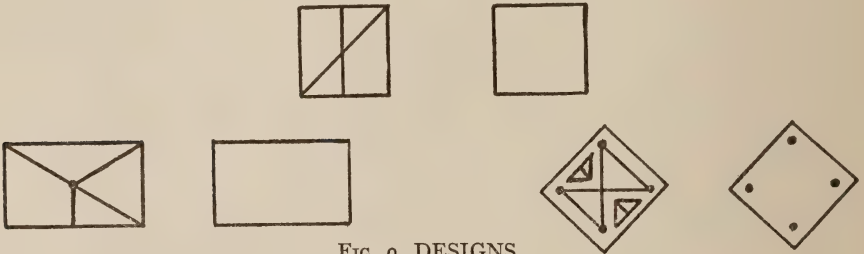


FIG. 9. DESIGNS.

The problem is to draw lines in the second figure so as to make it look like the first one.

Test 25. (Third test for age twelve)

Examples:

1. The fifth letter of the alphabet is .....

2. The first letter to the left of the tenth letter is .....

The problem is to supply the correct letter.

## GRADE VII-VIII

Test 30. (Third test for ages 15-18)

Examples:

1. my not is book that.

2. Mary I runs as as fast.

The problem is to rearrange the words in their right order to make a sensible sentence.

Test 32. (Last test for age twelve)

Examples:

1. quarter, nickle, dollar, dime, penny

2. colossal, tiny, small, enormous, large

The problem is to arrange in order from smallest to largest the items in each list.



Test 33. (Third last test in whole series)

Examples:

2, 4, 6, 8, 9, 10, 12.

27, 21, 24, 18, 17, 15.

The problem is to cross out the number which is wrong, *i.e.*, which disturbs the series progression.

## *ii. Individual Tests*

The Kuhlmann-Anderson Test, as stated, has been designed for administration to groups of people at one sitting. This, of course, does not preclude its being given to individuals who are alone. It is merely a matter of economy to test ten, twenty, or fifty people with one set of instructions, directed by one supervisor with or without assistance—the booklets to be taken and scored after the Subjects have left the test room. In the group test, the mental strength of the Subject is estimated in terms of his written answers and in terms of speed of response—or the number of correct answers found within a given time limit. Both quantity and quality are measured in terms of product set down on paper. It is obviously impossible for the Examiner to watch the “process at work” in the minds of each of the Subjects who register their abilities in this job-lot fashion. Hence, certain fundamental, qualitative aspects of each Subject’s procedure in solving problems, answering questions, *etc.*, are lost to the Examiner. To meet this need—to become more closely acquainted with other aspects of intelligence besides the recorded answer—the psychologist resorts to the “individual test” method.

Here he is alone with the Subject whose every overt reaction can be observed with undivided attention and whose own attention, for that very reason, is the less likely to be diverted to other than the job in hand. Hence, the individual test, other things being equal, is more highly reliable than the group test and should be used in all cases where the individual, rather than the group, is the object of concern. Whereas, the group test is used for measurement of man in the mass, for surveying group tendencies and abilities, the individual test is used in clinical analyses of individuals. This does not preclude its use in group comparisons, if time and funds permit.

In addition to the quantitative score earned, the Subject’s test procedures are observed to obtain enlightenment on such factors as: “Method of attacking problems, learning from experience, alertness, planfulness, persistence, interest, autocriticism, attention to detail, exertion or energy or effort displayed, tendency toward cau-

tion or initiative, reaction to success and failure, degree of self-confidence in supplying answers," and the like. Factors like these usually included under the term of "qualitative aspects," obviously require the constant and alert attention of the Examiner, who, at the same time, must exercise equal caution in interpretation. It is not necessarily safe to generalize from behavior in the test situation to corresponding behavior in everyday practice and life experience. Then, too, every test situation does not satisfy conditions evoking the above types of response. A thorough examination aims to employ several tests of different kinds, verbal and performance, which call for both language and manual responses. Of the first type the most widely used is the Binet.

#### Stanford Revision of the Binet-Simon Scale \*

There have been many revisions of the French psychologists' pioneer scale, but perhaps the most thorough-going and most extensive is that of Terman who offered his justly famous "Stanford Revision" in 1916. (169) Since that time the scale has been used all over America and has been reported upon by hundreds of workers in thousands of articles. The "Stanford-Binet" test is usually the basis of most clinical and school ratings on the matter of intelligence; without it, no clinical record is complete. The scale runs in applicability from age three to superior adult. Levels below three are sometimes supplemented by the "Kuhlmann Revision" for those years, although Professor Terman is now at work in perfecting his scale to include these lower levels in a forthcoming revision. Similarly at the higher age level—namely, those above fourteen to sixteen—the scale is lacking in sufficient material to test the brighter intellects adequately. As arranged at present the scale elements are somewhat too easy for the years before six and somewhat too difficult for ages above twelve. (173) The new revision which is to incorporate other changes is awaited eagerly by clinical psychology. We understand that there will be two forms.

A brief description of the present revision, by virtue of its distinguished record, is in order. For each year from three to ten, there are six sub-tests, scaled to represent the ability of children for their respective ages; in addition there are eight tests for the twelfth year, six for the fourteenth, six for the sixteenth, and six for the eighteenth, with a liberal sprinkling of "alternate tests" at most of the levels. An abbreviated form of the above is also allow-

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able. This form consists of the starred items in the regular test booklet.

The procedure in giving the test involves a quiet, unobtrusive room with no one present but the Subject and the Examiner; the establishment of *rappor*t between these two individuals, and the setting of the tasks by the Examiner according to standardized directions—these to be executed by the Subject, then and there. Illustrations of the various types of tasks at different levels follow:

For example, at age three, the Subject is asked to point to certain parts of his body, his eyes, his mouth, his hair; he is required to identify and name a key, a penny, a knife, a watch, a pencil; he is shown a set of three pictures and asked to tell what the picture is about. If he *enumerates* objects he is given credit at the three-year level; if he *describes* the contents of the pictures—a higher order of ability—he is given credit on this sub-test for seventh year ability; whereas, if he *interprets* the meaning of the picture—a still higher mental reaction—he is credited with twelfth year ability. At three years, also, he is asked to tell whether he is a little boy or a little girl, and to repeat a sentence of six or seven syllables, as, for example, "The dog runs after the cat."

If he succeeds in getting any or all of these sub-tests correct according to strict standards set down by Terman, he is given the opportunity to take tests on the next year group. "Passes" at this level entitle him to trials on the next, and so on, until he reaches a level where all his attempts result in failure. His score on all successes is then totaled and expressed in terms of an average "mental age." This is divided by his chronological age, and the quotient becomes his "Intelligence Quotient," or "I. Q."

Other tests at other levels include such tasks as: Giving definitions of words, graded for the different year levels according to difficulty; counting pennies and naming coins at six years; tying a bow-knot and copying a diamond at seven years; indicating the best way to find a ball lost in a field at eight and twelfth years—the grading of the response depending on the quality of the child's plan; finding rhymes for words at the ninth year; detecting absurdities in statements at the tenth year, such as "A man said 'I know a road from my house to the city, which is down hill all the way to the city, and down hill all the way back home.'" At the twelfth year he is asked to read a sentence in which the words have been set down in a mixed-up order; to point out a moral to some of Aesop's fables; to repeat five numbers backwards. At fourteen he is given some two-step arithmetic problems to solve mentally and is asked



to tell what time the clock would read if the hands were to change positions from those held at a given stated time.

It will be readily seen that the tasks grow progressively harder for each age, and when one operation is called for at different ages, such as defining words or repeating numbers, the extent of the child's ability to handle the problem is credited in terms of year levels. The Stanford-Binet can be administered only by Examiners who have had adequate training, according to standards set down by Terman (169) in his "*Measurement of Intelligence*" which has become the standard work of the profession. Unfortunately, this book has proved itself a not unmixed blessing, for being readily available to any purchaser, it has been used by trained and untrained alike. Hence in interpreting the significance of a Stanford-Binet score, it is necessary to ask: "By whom was the test given?"

The Stanford-Binet, when administered by authorized psychologists, is our most reliable and valid intelligence test. Many studies have reported on the reliability and validity of the scale when administered under different conditions. For details the reader is referred to some of these articles and especially also to the discussion on the "constancy of the I. Q." (pp. 51-55 of this book)

#### D. NON-VERBAL OR PERFORMANCE TESTS

##### *i. Group Tests*

The mental processes which are called into play in the various types of sub-tests, listed on pages 23 to 26 may or may not involve the use of language. Such items as "Completion of Complex Forms" and "Absurdities" obviously require a knowledge of language both in understanding directions and in executing responses; others like the "Rhythmic Series Completion" require a knowledge of number systems, and still others such as the "Mazes" and "Cube Analysis" can be administered without the use of any language at all. These tests lend themselves to pantomime directions and non-verbal responses, and can be set up to meet the needs of those people who, through illiteracy, deafness, speech impediment or handicap, do not speak the language of the Examiner, or who find unusual difficulty in expressing themselves in terms of symbols, ideas and abstractions (which mental operations are called for in the ordinary intelligence test). Psychologists have developed a different type of test, called the "non-verbal test," which not only can be given without the exchange of language between Subject and Examiner, but which often enables the Subject to use his hands in

manipulating materials, and do his thinking concretely, "with his finger tips" as it were. Some people can express themselves more readily with material before them than by manipulating ideas and abstract thought; their intelligence is concrete rather than abstract. The "performance test" is usually given to supplement a Binet rating. It is generally agreed that the Binet, being largely verbal, reflects environmental influences more than does the performance test. In the latter type of test the child is called upon to meet new situations and problems calling for forethought and planning ability, careful execution of plan, perseverance in the face of difficulties, and other types of adaptation which are independent of verbal skill. When given individually, blocks, pictures, formboards, and other three-dimensional materials are used; when given to groups, the range of material of non-verbal tests is limited to pencil and paper, but the content is selected to include symbolic processes other than verbal; such as pictures, designs, *etc.* As an illustration of the non-verbal type of group test a brief resumé of the Pintner Non-Language Mental Test will be presented here.

#### Pintner Non-Language Mental Test (133) \*

This test is composed of six sub-tests: Imitation, easy learning, hard learning, drawing completion, reversed drawing, and picture reconstruction. These six tests are contained in a large booklet, one page for each test. Half an hour is required to give the test, and there are set time limits for each sub-test. The tests are scored by means of celluloid stencils. Norms run from ages seven to thirteen, and for university students. This test is published by the College Book Company, Columbus, Ohio.

The first sub-test is an imitation test, based on the principle of Knox's "Cube Imitation Test." (See Test No. 15, of the Pintner-Paterson Scale, p. 37.) The Examiner points to some dots, according to a certain prearranged plan; the Subject, with a pencil, reproduces the Examiner's order of pointing. There are twelve lines of such dots, the sequences progressing from very easy to very difficult. The second test, or "Easy Learning," involves the use of three symbols to which digits are attached in a *key* at the top of the page. The Subject must show how quickly and accurately he can learn to associate digit with symbol. There are six rows of such symbols. The third is a harder test of the same general type, with nine digits and symbols instead of three. The fourth, or "Drawing Completions Test," consists of a page of pictures, in each of

\* Description and illustrations by kind permission of Dr. Pintner.

which some important element is missing; the Subject must fill in the missing part. The fifth, or "Series Reversed Test," consists of



FIG. 10. DRAWING COMPLETIONS.

ten geometrical line figures, arranged from easy to very difficult. The Subject must draw what the figure would be, if it were reversed—either upside down or turned right-left. The first two lines are supplied for the Subject's drawings; he must complete the rest him-

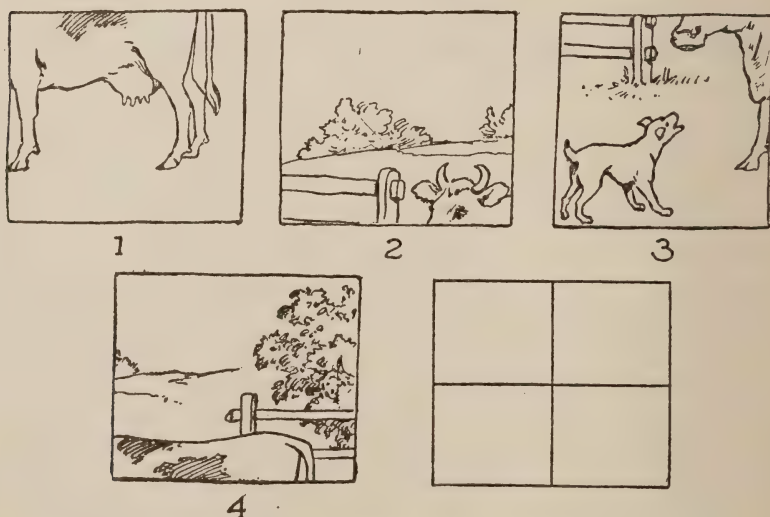


FIG. 11. PICTURE RECONSTRUCTION.



self. This is a test of "spatial relations." The last is a "Picture Reconstruction Test," consisting of six pictures, each cut into two or more rectangular parts and scrambled as to arrangement. The Subject must indicate the correct arrangement by placing the numbers of the separate parts in an outline. Again, the pictures are arranged from easy to most difficult. A sample item from the Picture Reconstruction Test is included in our Fig. 11.

More recently, Pintner has produced a Primary Non-Language Mental Test to take care of children below age nine or ten. Again, no language is required, directions being given by pantomime. Pintner finds that this test will discriminate children from four years to eight years; and that it can be given to deaf children in groups. This Primary Non-Language Mental Test is published by the T. C. Bureau of Publications, Columbia University, and is a useful supplement to the Pintner Non-Language Test.

## *ii. Individual Non-Verbal Tests*

### *Pintner-Paterson Performance Scales (136)*

Performance tests of many different kinds have been produced, but since each kind is limited largely to one operation, such as putting blocks in a board, building up designs or other models, *etc.*, it has been found necessary to use a number of them at a time in a "scale" or "battery," thus enabling several operations to be called into play at one testing. The Pintner-Paterson Performance Scale, which has been selected to illustrate this kind of testing, has fifteen sub-tests, calling for such operations as fitting cut-outs into a picture to complete the sense of the picture, whether this be a descriptive scene or a geometrical form; trying to fit irregularly shaped pieces to make up a standard form; learning to associate symbols with digits; tapping cubes in a certain order, as demonstrated by the Examiner; and so on. This scale was devised by Pintner and Paterson in 1919, based in large part on tests issued earlier by Knox (99) and Healy (77). The scale has been extensively used in situations calling for performance testing. Each separate test has been standardized on the basis of age. Hence a median mental age can be derived whether the long form consisting of fifteen tests be given, or some part thereof. Pintner and Paterson also offered a standardization based on points and another on percentiles for each test at each age, but these latter have not been widely used. For discrimination among adults the Army Performance Scale is advised.

A brief inventory of the tests in the Pintner-Paterson scale follows: \*

1. Mare and Foal Board. A simple farmyard scene in colors, showing horses, hens, trees, and so on. This picture is mounted on a board from which seven irregularly shaped pieces have been cut out. These must be fitted into their places.
2. Seguin Form Board. A wooden board from which ten blocks, cut into geometrical shapes:—star, cross, circle, and the like, have been cut out. The appropriate blocks must be fitted into their places.

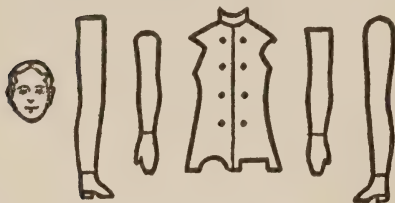


FIG. 12. MANNIKIN TEST.

3. Five Figure Board. Eleven pieces must be correctly fitted into five cut-outs.
4. Two Figure Board. Nine pieces are to be fitted into two cut-outs, in the shape of a square and a cross.
5. Casuist Board. Twelve pieces are to be fitted into four round or oval cut-outs.
6. Triangle Test. Four right-angled triangular pieces are to be fitted into a square and a triangular cut-out both in one frame.
7. Diagonal Test. Five geometrical pieces to be fitted into an oblong frame.
8. Healy Puzzle Construction Test A. Five small rectangular pieces to be fitted into a rectangular frame. Only one arrangement of the pieces will do.
9. Mannikin Test. (See illustration above) Legs, head, arms and body of a small wooden man are to be correctly put together.
10. Feature Profile Test. Ear, eye, nose and mouth are to be fitted into a wooden head correctly; the ear piece is divided into four separate parts.
11. Ship Test. A painted picture of a steamship cut into ten equal-sized pieces, these to be put together in their correct arrangement.
12. Pictorial Completion Test I. (See illustration, page 37) This is a colored picture, showing a child's playground scene, from which ten one-inch square holes have been cut out. The Subject must select ten blocks from fifty possible choices and fit them into the appropriate cut-outs.

\* From Pintner, R. and Paterson, D. G. *A scale of performance tests*. 1917. Description and illustrations by permission of publishers, D. Appleton & Company.

13. Substitution Test. Several rows of geometrical figures printed on a sheet of paper with a Key to the symbols printed at top. The Subject must write the correct digits after the figures, following the Key.
14. Adaptation Board. Board with four circular holes, one larger than the other three, into which a wooden block exactly fits.

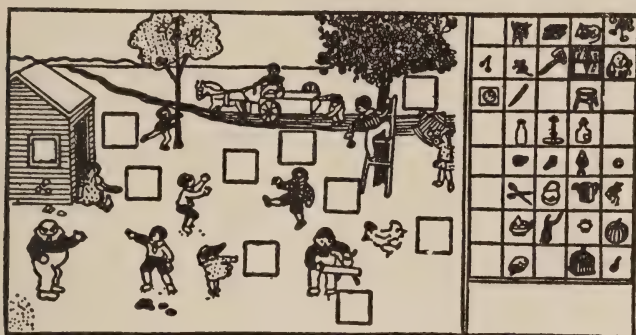


FIG. 13. HEALY PICTORIAL COMPLETION TEST I.

The Subject must fit the block into the right hole. The board is moved into five different positions by the Examiner, thus testing the Subject's ability to fix attention.

15. Cube Test. The Subject must watch the Examiner tap four cubes in a certain order, and then imitate his sequence. The arrangement runs from easy to difficult.

Scoring on this scale is done in terms of number of errors and time, except in tests 9, 11, and 12, where quality of performance is scored; and in tests 4, 8, 14 and 15, where correct moves are recorded, besides time.

There are many references to the use of this scale in psychological literature, especially in studies on racial differences, where language difficulties are involved. Its reliability and validity have been reported upon by Pintner and Paterson (136) and by Johnson (90, 1).

#### E. TESTS OF INFANCY AND PRESCHOOL LEVELS OF INTELLIGENCE

It will also be in order to discuss tests for very young children. Tests at these early levels should be of particular interest to the student of mental heredity because the native ability or capacity factor in intelligence has had less opportunity to be affected by environmental influence, first, in point of time, and, second, in point



of susceptibility. The first is self-evident; the second may need some amplification. Experiments of the sort reported by Gesell and Thompson (65; see also pages 207-208) indicate rather clearly that mental as well as physical ability is a function of the general growth process; that ability to do certain things, such as climbing stairs, manipulating small objects with the hands, learning to talk, and so on, depends for its primary appearance and the various stages of its development on the maturation process of basic neural structures rather than on training or other normal environmental influences. In other words, a child cannot be trained to build a cube tower, or climb a staircase, before his physiological equipment has reached a certain stage of growth; or to learn to use words before his neural structures are ready. "Maturation transcends training." Hence, the very early years (i.e. before language can set in) are less affected by differences in environment than are the later years; and *pari passu*, studies at these levels are of more significance to the student who is hunting for "innate individual differences" relatively uncomplicated by the "differences in environment" factor.

Gesell's (62, 63) system of measuring infant levels of intelligence, which is really a series of developmental norms of the human individual, offers a trustworthy, if not entirely accurate, scale of mental development of babies.

Bridges (12) points out some difficulties peculiar to testing sub-kindergarten children. The contrariness and general negativism of two-year-olds should be taken into account; their tendency to be afraid in strange surroundings, their fluctuating attention, their easy fatiguability, their resentment of adult coercion—all factors influencing responses to intelligence tests as much as does their actual mental ability. Great care should be taken in interpreting results at these lower levels, and tests should be administered only by Examiners skilled in handling very young children. Bridges also offers critical comments on some of the preschool test material. Here we shall illustrate the low level test by one of the earliest to appear, namely, the Kuhlmann-Binet.

#### Kuhlmann-Binet Scale \*

The Kuhlmann-Binet scale extends its tests down to three months of age. At this level such factors as motor-coördination

\* From Kuhlmann, F. *Handbook of mental tests*. Warwick & York, 1922. Description by permission of publishers.

Other infant tests and scales include: The Furfey Development Scale (54, 55); The Linfert-Hierholzer Scale (56, 108); The Bühler-Hetzer "Baby Tests" (17, 80); The Merrill Palmer Scale (166); and The Minnesota Preschool Scale (124).

play an important part. The child is given a small object and observed to see if he can carry it to his mouth. Both hands are tested. A telegraph snapper is snapped within two inches of either ear and if the child reacts with a start or wink, he is credited with a "pass." A bright object, such as an electric light, is passed from the left marginal field of vision to the right and his binocular coördination in following it is observed. At six months he is credited for ability to balance his head and sit up straight; to turn his head toward a sound; to oppose his thumb in grasping a one-inch cube; and to reach for seen objects. At twelve months he is credited with passes if he can stand up unsupported for five or more seconds; if he indulges in spontaneous vocalizations which combine two syllables; if he can imitate motions made before him, such as rattle-shaking, head-nodding, and the like; if he can mark with a pencil; and so on. Similarly for eighteen months and two years, adequate tasks are set which measure growth of development and function. Kuhlmann (100, p. 12) reports his standardization as having been made on twenty, forty-six, eighty-three, ninety-eight and seventy-one babies for ages of three, six, twelve, eighteen and twenty-four months, respectively.

The Merrill-Palmer Scale, The Minnesota Scale, *etc.*

The Merrill-Palmer Scale developed by Stutsman (166) is a combination of performance tests and verbal tests, and since its publication in 1926 has attained wide use in preschool and nursery groups and clinics. A series of tests for young children has very recently (1932) been developed at the University of Minnesota, Department of Child Welfare, by Goodenough, Foster and Wagenen (124). This scale is exceptionally accurate and reliable ( $r = .90$ ), norms having been standardized on 100 children at each of nine half-year age levels, or 900 children in all, selected to represent a cross section of the population. The test ranges from age eighteen months to seventy-two months. The "Baby Test" scale produced at the University of Vienna under the direction of Bühler (17, 80) and the infant "development norms" of Gesell at Yale are important guides for the observation of early mental development.

The extent to which early measurements of intelligence agree with measures taken in later childhood is just beginning to be investigated. Reports have come from Furfey and Muehlenbein (57) who throw doubt on the validity of infant scales, such as the Linfert-Hierholzer, to predict later intelligence; and from Hallowell (76) who finds her own series to correlate rather well with later

Stanford-Binet scores. Updegraff (186), on the other hand, finds a test given two weeks after nursery school entrance to be "appreciably more reliable" than one given just prior to entrance.

#### F. USE OF TESTS ON ADULTS

Up to this point we have been discussing tests largely in terms of their application to children. Here it may be stated that there is serious need of an *individual scale* adapted to fully matured adults. The subject content of the Stanford-Binet is excellently suited to childish, but not to grown up experience, even though some adults are of child mentality. The suitable adult test would contain material pertinent to adult experiences and interests, and the questions would refer less to the schoolroom than to activities of older people in the field, the office, the shop, the job, social gathering, *etc.* At present practically the only adult scales in use are *group* tests. These being of the pencil and paper variety are unsuitable for low grade people, or for people unaccustomed to handling a pencil; they also require a degree of concentration of attention, which the limited adult is incapable of sustaining alone. The give and take of an individual test would offset this handicap.

Thorndike (181) sums up some of the weaknesses of certain group tests for adults who have left school as contrasted to their efficacy for student-adults.

"The verbal and mathematical tasks which bulk so largely in these examinations may be more like those which occupy the intellects of children from five to fifteen, than those which occupy the intellects of young people from fifteen to twenty-five, or . . . of men and women from twenty-five to thirty-five. It is conceivable and probable that the person who ceases to improve in altitude 'CAVD'\* may continue to improve in altitude: Bu, Ch, Ho, So (Business, Child Management, Household Management, and Social Arrangement)." (p. 468)†

Thorndike points out that after acquiring such things as a vocabulary, a certain amount of mathematical skill, and general information common to all people, the adult usually devotes himself to specialized abilities useful in his trade, business or profession, hobby, and social circle. Doubtless, the better he is in his own field, the higher he would score on the Thorndike test "CAVD" (or any similar ability), but the relationship is not perfect. At a time

\* CAVD is Thorndike's own test (181).

† From Thorndike, E. L. *et al.* *The measurement of intelligence*. T. C. Bur. Publ., 1926.



when CAVD intelligence stops growing, the specialized abilities are beginning to enter their fullest expression.

Hence, adult intelligence tests, to be suitable, should make provision for the diversity of interests and skills which follow school-leaving age. The tests should be either comprehensive enough to include a fair sampling of all possible fields of mental skill (so as not to handicap the specialist in any one field) or should be specifically evolved and applied to meet the needs of special groups—and standardized on these groups.

Much of our present-day conception of adult intelligence has grown out of the studies of the Army psychologists who in 1917-18 tested thousands of drafted men representative of all walks of American life. The "Army" conclusions (13, 199, 200), in turn, startled the nation, gave rise to much controversy, stimulated further research into test standardization, and were themselves later pronounced premature. The basic data of the Army conclusions were drawn largely from scores in the group tests, known as "Alpha" and "Beta." Later and fuller understanding of limitations of these test materials have caused psychologists to discredit most of the Army results.\*

And what is even more pertinent, because of the wide variation of adult interests and activities and because of enormous discrepancies in the individual background of the Subjects (since leaving school), it is almost impossible to include within the compass of one test booklet material that would be equally fair to all. Hence, reports on surveys of adult intelligence, especially those surveys bearing the earlier dates, should be scrutinized critically for all factors involved before conclusions are accepted as valid.

#### G. USE OF TESTS IN INTER-RACIAL STUDIES

If individual variation in cultural, vocational, and general activity backgrounds within one nation render the use of a single test instrument invalid as between different groups, how much more impossible is the use of a common measuring rod as a tool of comparison for people of different national groups or races! Following the development of tests there appeared study after study which attempted to draw comparisons in intelligence between different nations and races. Obviously here, too, the findings were fraught with

\* For example, Brigham (14) has repudiated his own earlier conclusions on the grounds: (1) that an Alpha test score does not represent a "unitary thing." He holds the psychologists who add Alpha sub-tests do so without scientific justification. Brigham's other point, (2) is that groups brought up in one vernacular or even in bi-lingual homes, should not be given tests presented in a different vernacular.

controversy. Critics pointed out that it was unfair to test people of foreign mother tongue by tests couched in the English language; that certain test material was unduly familiar to one group and relatively strange to another, especially questions pertinent to conventions and practices within one type of culture; that the tempo or "speed" of certain civilizations would affect test scores; and that comparisons drawn on foreigners in America were not intrinsically sound since the American sampling might not be representative of the mother nation from which it came.

These claims to handicap were recognized and attempts made to circumvent them by developing a sort of "universal yard stick," which would be equally fair to people of all races and cultures. It was in making this attempt that the impossibility of creating such an instrument was admitted.\*

In a recent canvass of professional opinion (140) common agreement was found among the majority of psychologists that such testing could never be made perfect. Since the validity of a test is directly dependent upon the background of the group upon whom it was standardized, and since environmental backgrounds differ so widely among different racial cultures, it becomes obvious that inter-racial comparisons cannot be drawn on the basis of scores on a common test. Each new group to be studied involves a test of its own; usually containing material peculiar to itself. The wild boy of Borneo could not be expected to answer questions involving telephones and automobiles; nor could the California child be expected to reflect the key to Eskimo existence. [Liu (110), Walters (187), Helma (79).]

#### Intra-group Scaling

However, it would seem feasible by the use of multiple standardization to compare groups, differing *not too widely* in background. This means that the tests used should be standardized for each group; that each should contain enough elements common to all groups; and that material purely local to any one group be excluded. Obviously under such conditions the sub-test items in any one test would represent different degrees of difficulty for different groups, depending partly on their nearness to or remoteness from the experience of each standardization group. The extent to which any one group could reach out and grasp elements peculiar to the remaining groups might be some indication of its relative superiority

\* The nearest approach is the International Group Mental Tests, produced by S. Dodd and C. C. Brigham, of Princeton (37, 38).

or inferiority with respect to these contrasted groups; much like the specialist, intelligently informed beyond his own field.

For example: If Group A and Group B are to be compared, several conditions must be met. Each must have had its own test standardization on itself; each must then be given the privilege of trying the test which had been standardized on the other group. If Group A did better on B's tests, than Group B did on A's test, Group A could be considered the superior group. As we see it at present, this method, limited though it is, seems to be a possible way for drawing intergroup comparisons. Something of this sort was undertaken by Shimberg (148) in a comparative study of the "information-knowledge" grasp of rural and urban children. It should be possible also to find tasks, which though differing in materials, directions, and solution, are upon close analysis, psychologically comparable. This approach has not yet been followed.

#### H. SPECIAL ABILITY TESTS

A decade or so ago psychologists assumed that some people were "abstractly-minded," while others were "concretely-minded"; they sought to devise different measuring tools for those skilled in manipulating ideas from those skilled in manipulating objects; then came the need for tools to measure not only intelligence as a *general* thing but also the *special abilities*, such as skill in assembling the separated parts of mechanical contrivances, in artistic execution, in musical appreciation, and the like. The earliest attempts at measuring this special ability came in the work of Stenquist (162) whose tests of mechanical ability were used by the Army psychologists, first to measure general intelligence, and later to measure ". . . an ability markedly different from that discovered by verbal tests of general intelligence." Stenquist considered it a ". . . composite of common sense and skill in managing physical objects of a mechanical nature. It might be called general mechanical intelligence and ability." (p. 60)

The most recent contributors to the measurement of this special mechanical ability (129) define it as

" . . . the ability to succeed in work of a mechanical nature; or . . . mechanical ability is that which enables a person to work with tools and machinery and the materials of the physical world, and in doing so, to perform creditably or to turn out an acceptable product.

It may involve the inventing, constructing, operating and repairing of simple or elaborate implements and the planning and execution of pieces of work that involve their use. However, the ability . . . covers a range of activities from invention of airplanes and the design-



ing of bridges to the mere insertion of pieces of metal in a machine or the stamping of holes in leather." (pp. 6-7)\*

Their understanding of the term "mechanical ability" further stressed two aspects: first, skill in actual manipulation of tools and materials; and second, interest and ability to acquire information about such tools and materials, and the uses to which this information could be and was put.

#### Minnesota Mechanical Ability Tests †

To illustrate tests of special ability, the scale produced by the psychologists at the University of Minnesota will be presented. These workers, assuming that mechanical ability was a unitary trait in human make-up, set out to develop the most effective battery of tests to measure it. Using the Stenquist tests, Link's "Spatial Relations Test," and several tests of motor coördination and ability as a basis, they developed their present series, published in 1930. (129) The Minnesota battery consists of the following: The Minnesota Paper Form Boards, Series A and B; the Minnesota Spatial Relations, Boards, A, B, C, and D; The Minnesota Assembly Tests, Boxes A, B, C and D, and The Minnesota Interest Analysis Blank.

These tests show a high degree of reliability with coefficients of correlation running between .84 and .94, and low intercorrelations with each other, so that no two tests can be considered to tap the same type of ability. Most of the battery can be administered either as a group or as an individual test. About an hour's time is required to do the long form.

The Minnesota Paper Form Board consists of a test blank on which is drawn a series of different kinds of geometrical figures, those on the left of the page being large, and those on the right being smaller and parts of the large one. The Subject is required to draw lines on the larger figure to show how the smaller ones would just fit into it.

The Minnesota Spatial Relations Test can be given only as an individual test. It consists of four form boards and two sets of blocks. The blocks are arranged before the Subject in such a way that the order for Board A is the reverse of that for B, and the arrangement for C is the reverse of that for D. Each board is scored for time and errors.

The Minnesota Assembly Tests can be given in two forms, a

\* From Paterson, D. G. *et al.* *Minnesota mechanical ability tests*. Univ. of Minnesota Press, 1930.

† Description of these tests permitted by publishers, Univ. of Minnesota Press.

long and a short form. The long form consists of three boxes, containing various disassembled mechanical devices; Stenquist's original ten, of which two were changed, and twenty-four others. The two short forms, Sets I and II, contain material of equivalent difficulty to make up ten objects. The material in the three boxes is as follows: (pp. 104-5)

## BOX A

1. Expansion nut
2. Hose pinch clamp
3. Hunt paper clip
4. Wooden clothes pin
5. Linked chain
6. Bottle stopper
7. Push-button doorbell
8. Bicycle bell
9. Corbin rim-lock
10. Coin purse

## BOX B

1. Safety razor
2. Monkey wrench
3. Ringstand clamp
4. Test-tube holder
5. Spark plug
6. Inside calipers
7. Electric plug and wire
8. Clover leaf coin purse
9. Handle for iron
10. Mouse trap

## BOX C

1. Haemostat
2. Die holder
3. Pliers
4. Electric light socket
5. Wing nut
6. Glass drawer knob
7. Rope coupler
8. Kettle cover knob
9. Lock nut
10. Ford magneto-post
11. Petcock
12. Hose clamp
13. Radio switch
14. Pencil sharpener
15. Air gauge valve
16. Metal pencil

The short form consists of two sets of ten items each, selected from the above list to constitute equivalent forms. The tasks are to put together all the parts belonging to each object. Scoring is done according to detailed directions in the Manual (129) and based on a scale of credits for the amount correctly accomplished.

The Minnesota Interest Analysis Test may be used as a group or an individual test. It is a pencil and paper test and requires the Subject to register his liking for, dislike for, indifference to, or unfamiliarity with, a list of occupations. The score is the algebraic sums of the scores for mechanical and non-mechanical interests. The list of items and choices are set down (129).

The battery scores are computed according to weights assigned by the authors for the component parts of the battery selected. Different tests can be combined to make up different batteries, depending on the particular purpose and needs of the Examiner and his working conditions. On page 332 of their book, the authors have prepared a list of seven possible combinations and the respective weights which must be assigned to each test battery. The worker who plans to use this material should consult the original reference. (129) He will also need to interpret his scores by referring to the tables of norms which are set down in succeeding pages. These norms are expressed in terms of age, grade, percentiles, and sex, and range from Grade VII through university groups.

*i. Is Mechanical Ability a Unitary Trait?*

As evidence that mechanical ability is a distinct quality, a unitary trait, the Minnesota researches have established low correlations for mental ability and age, motor agility, I. Q., height and weight. (129) They state:

"It is still possible to define a mechanical ability for all practical purposes distinct from ability as measured by intelligence tests." (p. 247)

The following table, reproduced from their book, shows hows correlations conform to expectation, as, for example, that mechanical ability as shown in the tests correlates highly ( $r = .61$ ) with the quality criterion \* (*i.e.*, outside work), and that the I. Q. correlates .57 with the academic grades, even though the correlations between the other variables are zero or very low.

TABLE 1

COEFFICIENTS OF CORRELATION BETWEEN MEASURES OF SUPPOSEDLY UNIQUE TRAITS AND TWO CRITERIA, THE QUALITY CRITERION AND ACADEMIC GRADES<sup>1</sup>

Measure	r. Quality Criterion	r. Academic Grades
Age .....	.02	— .40
Agility .....	.03	— .13
I.Q. ....	.21	.57
Height .....	.09	— .30
Weight .....	.02	— .25
Mechanical ability, apparatus test battery.....	.61	.24

<sup>1</sup> From Paterson, Elliott, *et al.*, 129, p. 246.

The Minnesota psychologists appear convinced that their figures establish the fact that:

*"The mechanical ability test battery measures a trait which apparently is relatively unique with respect to all others."* (p. 247)

As further explanation of the data presented in the table, they write:

"As regards the uniqueness of mechanical ability, the evidence is consistently positive. High correlations with outside criteria mean that it easily meets the validity requirement. It also fulfills the requirement of low correlations with, and therefore independence from, the

\* The "quality criterion," against which the validity of the Minnesota Mechanical Ability Test was established, consisted of detailed objective measurements of various operations and completed objects. For those operations which could not be scored by simple observation or objective measuring device, rating scales were constructed. These separate scores were combined into a single quality criterion score. In addition, a "quantity criterion" and an "information criterion" were included.



other traits mentioned. Its correlations with intelligence are sufficiently slight to show that though the factor has not been completely eliminated, it is not present to a sufficient degree to make the measures of mechanical ability, to any considerable extent, measures of intelligence. The correlations of the apparatus test battery, with age, height, weight, and motor agility, are uniformly low, and in the neighborhood of zero." (p. 253)

Spearman (160) promptly attacks the claim of the Minnesota workers on the ground that his two-factor theory is ". . . in no way based on the absolute magnitudes of the correlations, be these high or low, but solely on their ratios to each other." (p. 114) He points out, in more detail, certain statistical irregularities and misinterpretations of their study, and calls attention to an earlier publication by Cox (31) who discovered the "uniqueness" of mechanical ability by basing his research on the theory of the two factors.

However, our concern at present is not so much with the discoverer, as with the discovery of an "isolated unique trait." What must also be recognized in the words of the Minnesota authors is that:

"Whatever these tests measure is mechanical *ability*, not mechanical *capacity*; just as whatever is measured by intelligence tests is intellectual ability and not intellectual capacity. Capacity is always an inference from measured ability." (p. 7)

Of two individuals who have had the same general background of experience and familiarity with tools, and the same incentive to use them, the one who scores highest on the test is the one with the greater native capacity. The tests are better measures of what people can do, than of what they will do. Actual mechanical output is determined by other factors, such as temperament, social pressure, other hobbies, leisure time, and the like; mechanical output and capacity are related in much the same way that intellectual achievement is not perfectly correlated with degrees of intellectual capacity, as expressed in terms of I. Q. or other mental measure.

## ii. *Measures of Musical Talent*

To date there are comparatively few tests of musical capacity, but its aspects are more or less measurable, such as sensory, motor, and feeling reactions. It is expensive in terms of equipment to test motor musical skill and difficult to reach the more elusive feeling or affective responses, but for sensory reactions tests are available, of which the most famous are the Seashore Measures of Musical Talent (144). These tests are offered on phonograph records and

can be used for group testing. They consist of six measures "of the most fundamental and essential capacities of the musical mind" (144, p. 1), namely, discrimination of: (1) pitch, (2) intensity, (3) time, (4) consonance, (5) rhythm, and (6) tonal memory. Needless to say, these tests do not measure musical accomplishment.

In (1) the Subject is instructed to listen to a series of one hundred paired tones, ranging in difficulty from paired differences of thirty vibrations to one-half vibration. He must judge whether the second tone is higher or lower than the first. (2) Intensity is measured by listening to paired sounds and judging whether the second is weaker or stronger than the first. Again, one hundred trials are offered, and differences range from just perceptible to a relatively wide range. (3) Time sense is measured by the Subject's ability to detect whether the second time interval is longer or shorter than the first. One hundred trials are offered, discrimination being tested by intervals running from 1.0 to 1.2 seconds. (4) Consonance is measured by the Subject's ability to judge whether the smoothness, blending, and purity of the second pair of tones is better or poorer than that of the first pair of tones. The test consists of twenty-five items which are repeated in inverse order, making fifty (5) Rhythm: Here the Subject detects differences in paired rhythmic patterns on the basis of time, or intensity, or both. There are fifty items, graded as to difficulty. (6) The last test measures one's memory span for tones. There are fifty trials, representing five degrees of difficulty, being two tone, three tone, and so on. The Subject tries to identify the changed tone. (105)

These tests have been subjected to considerable investigation, and some controversy over validity and reliability has ensued (49, 87, 145, 146). Seashore (145), himself, is emphatic that his tests of musical sensitivity are not in any sense measures of intelligence. It is possible for a relatively dull person to do fairly well in music, but great musicianship, calling as it does on other than strictly musical capacities, requires great general intellect for its execution as in the case of conductor, composer, concert artist, and the like.

Some of the most gifted and sensitive musicians are not interested in intellectual pursuits, and some of our keenest intellects have "no ear" for music. Pitch discrimination, for instance, as Seashore points out (145), is not a matter of logical judgment but of sensitiveness of the mechanism of the inner ear. The physiological limit of pitch discrimination does not vary with intelligence, or with age or sex. It cannot be appreciably improved with practice. To quote:

"... the physiological limit of pitch discrimination, the 'ear,' does not vary with intelligence for normal individuals. The extremely dull person is, of course, more likely to give a cognitive limit than the bright person in the first measurement, but keen intelligence is by no means a guarantee of keen tone discrimination. . . . Pitch discrimination is not a matter of logical judgment. It is rather an immediate impression, far more primitive than reflective thought, and dependent upon the presence or absence in various degrees of the sensitive mechanism in the inner ear." (pp. 56-7)\*

The sense of rhythm and consonance seems to be instinctive and shows wide individual differences. Age, and training, and intelligence but slightly affect ability to discriminate time. Musical memory, however, is subject to training.

Studies by Hollingworth, Fracker, and many others (49, 87, 105), support the evidence that, beyond the intellectual level required to understand and follow directions on the Seashore test (about ten years of age), the performance is not symptomatic of intellectual endowment. Hollingworth's (87) gifted children, for instance, ranging from 135 to 190 I. Q., although they covered themselves with distinction on intelligence tests, did no better than the average children of their age on the musical tests.

The Seashore Measures of Musical Talent can be given to groups of individuals who are old enough to follow group directions. Norms are supplied for three age levels: Grade V, Grade VIII, and adult—with percentile distributions at each level. The test requires about an hour and a half to give.

### Tests of Other Abilities, Skills and Attainments

Other special abilities and skills for which tests have been devised include: Art, motor skills and dexterity, sewing, cooking, and so on. However, these capacities, it will be noted, merge directly into the special subject-matter fields of school achievement. The progress made in such educational measurement has far outstripped the efforts along other lines of psychological activities and embraces a special field of testing which will not be touched upon here. The interested reader is referred to special texts and reports, such as those of Hildreth, Smith and Wright, Symonds, and others. (81, 156, 167, 107, 119, 120)

### iii. Tests of So-called "Social Intelligence"

A few words may be said on the attempts which have been made to test that aspect of intellectual ability commonly referred to as

\* From Seashore, C. E. *The psychology of musical talent*. Silver, Burdett, 1919.



"Social Intelligence"—not because these tests constitute significant contributions to the testing field, or because "Social Intelligence" is a special ability or unique trait, but because emphasis has frequently been placed on it in classifying different "kinds" of intelligence.

The Bureau of Public Personnel Administration staff, which has developed a partially standardized test of social intelligence (18), defines it as:

"The ability to adjust to new situations involving relations with other people and to adopt a course of action which is effective in the sense that it leads others to do consistently and voluntarily the thing it is desired that they should do. . . . This course of action . . . may be moral or immoral, legal or illegal, constructive or destructive, desirable or undesirable. The essential thing is that the person having a high degree of social intelligence is able to get others consistently and voluntarily to do the thing he wants them to do, and even to like doing; while the person without considerable social intelligence cannot consistently bring about such results." (p. 73) \*

Strang (165), who sums up the meager work done in the field of social intelligence measurement, finds that it is frequently defined as the "ability to deal with people"; also, that it is analyzable into two phases, not necessarily related: "The knowledge aspect, and the functional aspect." Attempts have been made to measure these two aspects by (1) pencil and paper tests for measuring knowledge, and (2) real situations which are used as tests; also by rating-scales, questionnaires, photographs, and the like, ". . . to ascertain the extent to which an individual reacts in a social way or possesses certain skills or traits judged to be useful in social situations." (p. 263) Strang finds a need for improvement in tests of this sort, especially in regard to validity and reliability.

The Bureau of Public Personnel Administration has set down certain factors behind this complex capacity which seem to be related in no small degree to innate capacity. These underlying determiners are abstract intelligence, social experience, differential social customs, and seriousness attached to infringements thereof, and other factors, such as patience, silence, stubbornness or persistence beyond certain points in a social situation. Obviously, this mental territory becomes the borderland of the "field of personality" discussed in our Chapter II. As in all human characteristics, no hard and fast line can be drawn between one group and another. Classi-

\* From: Partially standardized tests of social intelligence. *Publ. Personn. Studies*, 1930, 8.

fications, at best, are arbitrary and are made merely for ease of presentation and discussion.

The first definite attempt to test this "sociability" aspect of human personality, which obviously is not a unit characteristic, but a complex pattern of behavior, was the George Washington Test of Social Intelligence devised by Moss and his associates (125). This test consists of a paper folder in which are set down five sub-tests calling for: (1) A judgment in social situations; (2) recognition of the mental state of the speaker; (3) observation of human behavior; (4) memory for names and faces; and (5) sense of humor.

Preliminary studies suggest that it is unprofitable to try to discriminate social from general intelligence by use of Moss and Hunt's test. (15, 69, 116, 137, 165) Although it may be too early in the history and development of mental testing to assume a high diagnostic power for any test of social intelligence which may be offered at this time—a difficulty shared by all attempts to measure personality traits—nevertheless, this ability which is called "social intelligence" is a most important factor in life adjustment. Complex socialized living and group dependence put a premium on this ability to understand the motives which govern the other fellow's actions and to be able to predict his behavior in given situations, interrelating with other people and other situations; and granted the understanding, or knowledge of the forces at work, to so govern one's own attitudes and actions to produce the desired effect in others, and yet not sacrifice one's own point of view, self-respect, or whatever quality seems to be at stake. It is more than tact and sagacity, and executive ability combined, but its detailed analysis and testing will have to await a later date.

#### IV. THE CONSTANCY OF THE INTELLIGENCE QUOTIENT

The constancy, or stability, or relative fixity, of the I. Q. has engaged the research activities of very many psychologists. But the number of investigations is not at all out of proportion to the importance of the problem. Earlier workers with intelligence tests noted that, as the child grew older in years, his quotient did not necessarily change. This constancy of the I. Q. from year to year for each child who continued to live in a "normal" environment, led to the concept that the amount of intelligence, in proportion to age,

is predetermined by hereditary forces. It was not long before constancy for the I. Q. was assumed as one of its fundamental attributes. Then came fresh evidence from data showing changes in I. Q. with certain changes in environment. This led to a closer scrutiny of facts, and article after article followed, setting forth the results of analysis of test-re-test findings; re-tests, given after short intervals and long intervals; first, second, third, up to six or more re-tests on the same children. I. Q.'s were studied for stability among different kinds of children: feeble-minded, dull, normal, superior; at lower ages and for intermediate and higher ages, both on the initial and on the re-test. Evidence has accumulated now, so that Foran (44-46), who has drawn up a summary, has been able to assemble some eighty titles in his bibliography. Several studies have been reported upon since Foran's survey of the literature, and these will be listed in the bibliography at the end of the chapter. See: Sims (152), Hirsch (84), Brown (16), Wellman (190), P. Cattell (25), Hallowell (76). Very recently, 1933, Nemzek (126-a) has presented an admirably condensed summary.

The characteristic behavior of the I. Q., especially that obtained from the Stanford-Binet test, may be summarized as follows (the conclusions being taken largely from Foran's article):

In general, *i.e.*, for about half of the cases, the I. Q. can be expected to vary up or down from zero to five points, from test to re-test, for any individual. For a few cases it will vary more; for a few cases, less. The range of variation is from zero to about twenty points. Deviations are significant above ten points, which happens for about twenty per cent of the cases. Hallowell (76) reports very much the same range of variation for children aged three to forty-seven months. The following table sums up findings on I. Q. variation from test to re-test as determined by several different investigators:

TABLE 2

MEASURES OF THE VARIATIONS IN THE I. Q. ON RE-TESTING AS FOUND IN SEVERAL TYPICAL STUDIES \*

Author	N.	% Differing 10 points or more	Limits of Middle 50%	Average Change	r. Between two Tests
Terman (1919) .....	435	.15	-3.3 to +5.7	4.5	.93
Rugg and Colloton (1921) ..	137	.12	-2.2 to +5.6	4.7	.84
Garrison (1922) .....	468	.085	$\left\{ \begin{array}{l} -2 \text{ to } +4 \\ -3 \text{ to } +4 \\ -3 \text{ to } +5 \end{array} \right\}$	5.4	.88
Rugg, L. S. (1925) .....	114	...	-1.2 to +1.9	3.1	.95

\* From Freeman, 51, p. 345. Used by permission of, and by arrangement with Houghton Mifflin Co.



The above studies indicate the amount of I. Q. difference which is likely to take place for the middle fifty per cent of the normal distribution of children. On this basis a change of two P E. (*i.e.*, greater or less than the above limits) would happen fairly frequently, and even of three P E. once in a hundred cases or so.

When I. Q.'s of successive tests are correlated, the coefficients run from .80 to .95, depending to a large extent on the homogeneity of the group from which the I. Q. data were obtained. Correlations which are as low as .80 point to inadequate conditions in the test or the testing situation.

When cases are subdivided into ability or age groups (*e.g.*, feeble-minded, average, superior, *etc.*), less variation is found among the feeble-minded than among the normal; changes for this group tend to go in the direction of decrease rather than of increase. Degree of mental deficiency seems not to influence variation in I. Q. Among superior children the I. Q. remains relatively constant, except that due recognition *must* be taken of the fact that the Stanford-Binet test material is limited at the upper end in such a way that it is impossible for anyone to obtain a higher mental age than the test material allows for. This mental age limit is 19.6 years, with some additional correction recently allowed by the Stanford psychologists. (173) The fourteen-year-old child who "hits the roof" of the test can earn an I. Q. of only 140 because there are no higher level tests for him to take. At fifteen he is even more handicapped (I. Q. 130), at sixteen, still more (since he can then earn only 122 I. Q.); so that, merely to continue dividing M. A. by C. A. gives a distorted picture of the case. Beyond age sixteen changes in C. A. are not recognized, the denominator being always sixteen. Hence for children over sixteen at the time of the first test, there is a high degree of constancy for successive re-tests. It is to be expected that this weakness in the upper reaches of the Stanford-Binet will be corrected in a forthcoming revision of the scale.

Attention must also be directed to the fact that there is more I. Q. fluctuation among young children (under six years) than among older children, since their negativism, timidity, *etc.*, make it more difficult to obtain a true score for preschool ages.\*

\* However, Gesell (63, p. 148f) reports surprising consistency for mental growth curves of the same children from year to year, some of these children having been examined as often as ten times. Gesell's findings and conclusions are not drawn from Stanford-Binet ratings, but from his own calculations of "developmental level" which include mental and physical checks. He notes this consistency of growth for all types, whether normal, accelerated, or retarded. Irregularities of growth are due to different complications, medical and social, which disturb the developmental process. However, one is more impressed with Gesell's point of view than by his actual research data.

## A. CAUSES OF VARIATION IN THE INTELLIGENCE QUOTIENT

The conditions set up by the test situation may cause variations in the scores from test to test because of the effect of such factors as the following: (a) Clerical errors of estimate (rare); (b) Degree of rapport between Subject and Examiner (rare); (c) practice in taking tests (rather slight); (d) fluctuation in interest and effort on the part of the Subject taking the test (rather slight, except perhaps for very young children and psychopathic patients); (e) abnormal physical conditions (somewhat over-emphasized since tests are not given under such conditions); (f) language handicap (rather more serious for duller children than for superior children); (g) change in Examiner from one test to another (re-test coefficients dropped from .87 to .79 with change in Examiner (81); (h) marginal successes and marginal failures, *i.e.*, a child almost succeeds in passing one or more sub-tests, but fails to get credit, which he later obtains on re-test; or, *vice versa*, he barely passes, or passes by chance only, and the quality of his response is so near the margin that it cannot be maintained on re-test.

Limitations inherent in the original standardization of the test used may be responsible for fluctuations in the I. Q.; these include, (a) the weakness of sub-tests at the higher mental levels. Until the Stanford-Binet scale is supplied with sub-tests, sufficiently difficult for the brightest Subject to fail on, we do not know how much higher he still might go. (b) The units of measurement are equal throughout the scale—namely, one month of mental age. Obviously, a gain or a loss of one month at age three has much more significance on the size of the resulting I. Q. than at age ten or sixteen. Pintner (135) points out that an additional month at one year increases the I. Q. eight points; at two years, four points; at five years, two points; at eight years, one point. (c) When the intervals between tests and re-tests do not correspond to multiples of the units of measurement of the scale, constancy of the I. Q. may be interfered with because of this mathematical factor; indeed, at times it may result in identical I. Q.'s from test to test when they would not be so if the units were finer. (d) It is possible also that some of the sub-tests have been standardized at the wrong age levels. Experience in working with the scale suggests that the standardization placed the tests at the lower age levels as too easy, and those at the upper levels as too hard for normal children. This weakness will be corrected in a forthcoming revision of the scale. It has caused some differences and no little confusion in interpretation

of certain research data. (See pp. 248 ff) (e) Mental functions measured at different age levels on the scale are not always the same. This accounts for some variation in I. Q. A child exceptionally strong or weak in some mental process, *e.g.*, picture interpretation, visual imagery, mathematical ability, may not have a chance on re-test to record his degree of development in that function—an ability which earlier had served to elevate or depress his I. Q.

The effect of the environment in changing the relative intelligence of the individual from time to time will be discussed in a later chapter, although it may be said here that there is some evidence for: (a) Less constancy among psychopaths than among normal individuals, but that this difference is due probably to one or other of the factors discussed above rather than to the actual condition of psychopathy. (152) (b) For some individuals there may be irregularities or “spurts” in rate of mental development, just as there are in physical development. Not much evidence has accumulated on this point.

In brief, then, an I. Q. variation of as much as five points from test to test can be looked for from the average individual. The greater fluctuations which occur, though less often, may be explained by a change in actual intelligence ability, or by changes in the conditions inherent in the test material, or in the test situation. Such factors render it imperative that an I. Q. should never be issued or interpreted except by a highly trained, competent psychologist.

Much the same picture is presented in a study of the constancy of the intelligence quotient obtained from group tests. On such tests the personality of the Examiner is a minor factor in itself, but on the other hand, a group test is less reliable in itself as an instru-

TABLE 3  
THE CONSTANCY OF THE I. Q. ON GROUP TESTS \*

Author	Date	n	r.	Interval	Test
Garrison and Robinson .....	1925	131	.90	10 months	National Intelligence
Bowie and Laws...	1925	131	.91	20 months	National Intelligence
Pintner .....	1925	26	.87	6 months	Northumberland
Nettles .....	1925	26	.72	4 years	Pintner Non-Language
Shewrman .....	1926	130	.85	3 years	Terman Group
Broom .....	1926	229	.77	3½ years	Terman Group
Cowdry .....	1927	102	.93	1-23 months	Terman Group
Keys .....	1928	207	.75	1 year	Thorndike Intelligence
		200	.81	1.3 years	National Intelligence
		200	.78	2.8 years	National Intelligence
		200	.75	4.0 years	National Intelligence
Lamson .....	1930	53	.83	5 years	Army Alpha

\* From Pintner, 135, p. 90. Used by permission of, and arrangement with, the publishers, Henry Holt and Co.



ment. Table 3 taken from Pintner (135) presents a summary of the findings of several investigators on the constancy of I. Q. with group tests.

## V. DISTRIBUTION OF TEST INTELLIGENCE AMONG THE POPULATION

Among adults who can be considered to have achieved their mental maturity, there is to be found a wide range of individual differences in intelligence. No matter in what units of measurement this mental ability is expressed (*e.g.*, Mental Age, I. Q., raw score, *etc.*, on certain tests), there will be found a few people who are extremely dull, a correspondingly few who are extremely bright, and a great mass of individuals of gradually varying ability between these two extremes.

When these measurements are plotted and charted there results what is known as a "normal distribution curve." (See Fig. 14)

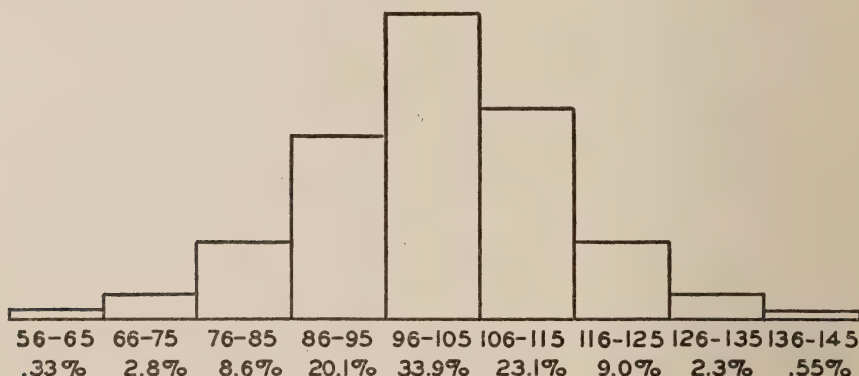


FIG. 14. DISTRIBUTION OF I.Q.'S OF 905 UNSELECTED CHILDREN, 5-14 YEARS OF AGE. From L. M. Terman. *Measurement of Intelligence*. By permission of, and by arrangement with Houghton Mifflin Co.

Before Norsworthy (128) made her pioneer explorations in 1906, mental defectives were popularly regarded as a "race apart" in the sense that they were thought to form a separate, discrete group in themselves, distinct from normals, with distinctly different laws of mental operation. It is now definitely recognized by psychologists that mental defectives have *quantitatively* less of the general psychological trait called "intelligence," but that they are not an isolated group. Statistically, this means that they occupy one extreme of the normal distribution curve, the dullest (the idiots

from 0 to 20 I. Q.) being at the lowest end; those rather better endowed (the imbeciles from 20 to 50 I. Q.) occupying a higher location on the curve; and those still more favored intellectually (the morons, from 50 to 70 I. Q.), being nearer the normal. The whole group of "feble-minded" or "mentally defective" represent only a small fraction of the general population. (169, p. 78 f) Percentages vary a bit with the criteria selected. The bulk of the people can be considered as definitely not mentally deficient; but of this bulk a large percentage, perhaps ten or fifteen, represents a group of "borderline" intelligence; above that level the degree of intelligence increases gradually until normality is reached, at which location in the I. Q. scale the greatest number of people are to be found. As the upper ranges of I. Q. are approached, the numbers represented become less and less until the "genius" \* level is reached—above which point less than one per cent of the population will be located.

The point to be stressed in this discussion of the distribution of intelligence is that mental ability of *all levels* is to be found in a

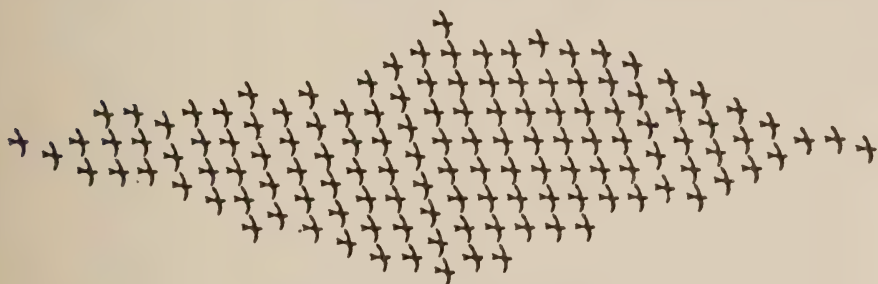


FIG. 15. BIRDS IN FLIGHT.

normal population; that there are no distinct gaps between people; that if all people were lined up in order from the dullest to the brightest, the gradation from one to the next would be so gentle as scarcely to be noticeable; that there would be a few people who were extremely dull and a few who were extremely bright, and a great many indeed who were average or nearly so.

The distribution of any human variable has been likened to the picture of a flock of birds in the sky; a single one or two lead,

\* "Geniuses," in the psychologist's conception of the term, are not a discrete group, either; they are those people who are highly gifted with test intelligence, who, quantitatively considered, have very much more of it than have so-called "normal" people (169, p. 101) (19, 173). Terman's investigations have tended to substantiate the fact that high I.Q. children have other desirable characteristics: *e.g.* physique, personality, social qualities, *etc.*

followed in line by more and more birds, the heaviest cluster being at the center, or "average"; from here the grouping thins down gradually until the rear, where perhaps a single member may be located.

## VI. SIGNIFICANCE OF TEST INTELLIGENCE FOR ACHIEVEMENT

A great deal of evidence has accumulated on the relation between intelligence test scores and achievement in the activities of life.

"Achievement" is a broad term; and any study of the relation of the two variables requires a high degree of specificity of terms. This difficulty can perhaps be met by approaching the general term half-way; by referring to "achievement in school" (a measurable attainment); "achievement in one's vocation" (a less measurable product); "achievement in earning money" (that popular criterion of "success," and measurable, if incomes can be ascertained); "achievement in social living"; in "rearing a family of successful members"; in "making contributions to the welfare of mankind," or any other specified type of achievement.

Obviously "success" becomes less measurable as we move from the first to the last named accomplishment, and research workers have been hard put to it to estimate a criterion of "success" in any particular field of activity selected. They have often resorted to "judgments" or "opinions" or "ratings" by others; but these have been shown to be highly fallible. (See, for example, the discussion on pp. 106 f) Illustrative of their procedures, it may be noted that to measure professional success investigators have, at times, considered the inclusion of the Subject's name in such lists as "*American Men of Science*" (Cattell), "*Who's Who*," and so on. To measure success in school, class grades have often been used, but these have been weak as measurements of comparison on account of different standards held by different teachers. More reliable are the scores made on certain standardized educational tests. It is in this field that the greatest progress has been made in ascertaining the significance of intelligence for achievement. However, other influential conditions must be observed before interpretations can be made. Often what an individual actually achieves is out of proportion to what he could achieve, but for the interference or effect of certain variables, such as health, interest and ambition, motivation, eco-



nomic drive, responsibility towards others, "moral" support and encouragement by others, and personality thwartings—as timidity, sensitiveness, uncontrollable temper, and the like. On the other hand, certain dynamic qualities of aggressiveness and persistence often overcompensate for intellectual weaknesses. The point is that all possible influencing factors on achievement must be accounted for.

#### A. INTELLIGENCE AND SCHOOL ACHIEVEMENT

As mentioned before, many studies have been undertaken to show the relation between intelligence (as measured by test) and class grades or scores on certain educational tests. These studies will not be discussed in detail here; they have been reviewed by Pintner (135, p. 266 ff.). See also Jordan (91), Geyer (66), Dickson and Norton (36), Madsen (112), Colvin and McPhail (29), Gates (61), Kempf and Collins (95). A complete summary of the literature on the relation of test intelligence to achievement in school would fill volumes. The findings in general are (for elementary school children) that there is a positive correlation\* between intelligence test score and school achievement, the coefficients being around .60. Burt (21) reports a coefficient of .91 for 699 children, ages seven to fourteen; and with age constant, this coefficient is .68. Others to report correlations are Gates (61), Kempf and Collins (95), Hollingworth (86). Pintner (135) finds that the correlations are always positive and states in his summary:

"Coefficients between .30 and .60 seem to be most frequent. The great variation in these coefficients is due to many factors, such as the homogeneity or heterogeneity of the group; the reliability of the educational ratings, the great differences in the intelligence tests used; the range of ages included in any one group, the thoroughness with which education and intelligence have been measured in each case and other similar factors." (p. 267)

Studies by Denworth (34) and Heilman (78) approached the relationship from a slightly different angle; it was the purpose of

\* Reasons for the occasional negative correlation between Intelligence Quotient and Achievement Quotient (that is, achievement in school work proportionate to the relative test intelligence of the child) have been suggested by Franzen (50) as being not so much in the nature of the mental situation as in the organization and procedure of the classroom. It is well known among school men that dull children receive an undue amount of prodding and stimulation to work up to their maximum capacity, and that bright children, because of the superior nature of their work when contrasted with others', "get by" with almost no effort on their part. With equal stimulation to achieve up to their level of ability, the superior children would produce considerably more and better work.

these investigators to study the significance of other factors, such as school attendance, in determining school success. They found that the actual amount of exposure to school instruction is less important than the mental material upon which it is acting. The conclusion of these investigators was that mental age is the greatest factor in determining achievement. Heilman found that only five per cent of variability in school achievement could be accounted for by school attendance, *per se*. Of course, where gross deficiencies have been the rule, such as obtained in the Gordon (73) and Hirsch (84) investigations the effects have been deleterious on both educational and intelligence test scores. The matter is taken up in greater detail elsewhere in this volume. (See pp. 282 ff)

It would seem to be a valid conclusion, then, to hold that attainment in the elementary school, at least, is but *slightly* influenced by *ordinary* differences in school attendance, and *considerably* influenced by *ordinary* differences in native brightness.

Studies of the relation between intelligence and achievement in high school report coefficients ranging from .35 to .65 (135). This range is lower than that reported for elementary grades and is due in part to the fact that children of low ability do not get into high school. The range of ability in the high school group is thus curtailed, *i.e.*, a more homogeneous group is the result, which fact, in turn, operates to lower a correlation coefficient. Still more so does this condition obtain for college levels. Other factors which act to influence pupil progress in high school more than in elementary school are the lower reliability of marks given for advanced work, the lower reliability of intelligence tests at the older age levels, individual differences in effort, application, and interest. As children grow older their interests become more specialized, and their energies often more scattered outside of the schoolroom.

Even more so do these extra-intellectual factors influence scholarship in college. Here the coefficients rarely go above .6 and in a few cases drop to zero. Wood (197) who reports "extremely reliable" coefficients for Freshman and Sophomore years ( $r$ 's of .632, and .62 respectively) lists the following influences which operate to lower the correlation among adult students:

"Health, industry, interests; freedom from worry or grief; freedom from distractions, such as voluntary activities like athletics, dances, student journalism, etc., or necessary penances like commuting on crowded trains or working nights for a living; happy choice of and adaptation to particular branches of study—to expect a correlation of 1.00 between intelligence scores and the result of such complex and variable forces as these would, of course, be absurd." (pp. 73-4)

Nevertheless, as a measure to predict college success, Wood finds that "the intelligence test stands without a serious rival," its closest competitor being the New York State Regents Examination, which he considers "as much an intelligence test as it is a content examination." (p. 274) McPhail (29), who reports coefficients centering between .30 and .50, also relies heavily on the predictive help of the intelligence test for successful achievement in college, particularly during the first two years. In the last two years coefficients are apt to run lower; the students at these levels have been pretty well "selected" for ability, and have settled down to a specialization of courses.

Reports in general agree that intelligence is the most significant *single* factor in determining successful work at school; that the higher the school work required, the greater the elimination of poorer intellects. A certain "minimum" is required to master work at various educational levels: *e.g.* an I. Q. of 70 is seldom able to do satisfactory work beyond the sixth grade. In high school the child with I. Q. between 90 and 100 "will have great difficulty in graduating." (135) The grade of intelligence required to do college work varies with the standards of the different colleges and with the courses pursued; the more abstract subjects, such as philosophy, requiring considerably higher type minds than the more concrete subjects, such as are to be found in home economics courses.

#### B. STUDIES FROM STANFORD UNIVERSITY

The ideal technique to study the effect of intelligence and success in life would be to have accurate measures of each; especially to have early measures of intelligence on a large number of children and later to follow up the attainments of these individuals for correlation data. However, since the mental testing program is of such recent origin, more time must elapse before sufficient data will have accumulated to make such studies possible. In the meantime, Terman (173), Burks (19), and their associates have made an excellent beginning, having followed 1000 gifted children over a ten-year period. Many of the children have graduated from high school and college, and have already given an indication of their advanced scholastic attainments. If the study can be continued another twenty years, when these individuals will be middle-aged, it will be most worth while.

As far as they have gone, Terman and his co-workers find that the prognostic, or predictive, value of early measurements of intelligence is high. Specifically, Terman reports:



I. For intelligence: The gifted children who took the Thorndike College Entrance Examination before entering Stanford rated, on the average, higher than the average of all entering Stanford students, by about "one Standard Deviation of the scores of the distribution for all Stanford entrants." This means that 84.13 per cent of *all* Stanford students made scores lower than the average (or fifty per cent mark) of the *gifted* group, and that only 14.69 per cent of *all* Stanford students made scores as high as those earned by the top fifty per cent of the *gifted* group.\* (p. 62) It will be interesting to examine other than intelligence test records.

II. In school progress: Seventy-four per cent of the gifted boys and eighty-four per cent of the gifted girls were advanced, as judged by the Ayres-Strayer age-grade standards. Acceleration is shown beyond earlier expectations, when sixty-seven per cent had been found advanced. In terms of age of graduation from Grade VIII (normal age is thirteen to fourteen—eleven), gifted boys passed at thirteen—one, and gifted girls at twelve—ten. In terms of age of graduation from high school (normal age is seventeen to eighteen—eleven), gifted boys passed at sixteen—ten, and gifted girls at sixteen—eight. (p. 83)

III. In scholastic achievement: The average scores of the gifted group on the Iowa High School Content Examination were decidedly above the norm. For gifted high school seniors and college freshmen the acceleration was: For boys, 1.5 to 2 S. D.'s above the control average; and for girls, 1 to 1.5 S. D.'s above the control average. Converted into per cents, this means that from 92.65 to 97.72 per cent of normal boys made scores lower than the average of the gifted, and 84.13 per cent to 92.65 per cent of normal girls made scores lower than the average of the gifted girls. These figures become even more startling when one remembers that average high school seniors represent a "selected" grouping, perhaps, with some overlapping, the "upper fifty per cent of the generality of children." (p. 99)

IV. In school grades: Again, the gifted children, boys and girls, received higher marks than do regular groups, having received grades of "A" about four to eight times as often as do regular pupils in the same subjects. (p. 108)

In regard to honors earned at Stanford College, thirty per cent of the gifted were elected to Phi Beta Kappa as compared with ten per cent of regular seniors, and the proportion who graduated

\* Transmutations of S.D. to per cent taken from McCall (115, p. 274). 1 S.D. is 34.13 per cent.

"with distinction," and "with great distinction" was more than twice as high for the gifted as for the generality. (p. 109)

Comment is scarcely necessary, as the above abstracts speak for themselves in setting off the superiority of the gifted group in school work.

Other data are given on physique, health, social and personality traits, vocational intention, and so on. In time, it is hoped that actual "achievement" or "success in life," rather than only progress in school can be intensively studied for this interesting group.

This follow-up study of children at the upper extreme of intelligence could be contrasted with studies made by Fernald (42), Town (185) and others, on community adjustment, vocational success, *etc.*, of children at the lower extreme of intelligence, *i.e.*, children who were once inmates of institutions for the feeble-minded. This, supplemented by field work of the sort first reported by Goddard (71), emphasizes the essential significance of "degree of intelligence" for successful placement and retention of job.

A second technique pursued by Terman (170) and later by Terman's associate, Cox (30), is a "backward" rather than a "forward" type of investigation, namely, to estimate the I. Q.'s of historically eminent men on the basis of recorded data. This method is admittedly crude, but ingenious, in that it offers a rough measurable criterion of early ability against which to compare later eminence.

Terman (30) editorially sums up the general findings of Cox's study:

"As to the essential validity of the more important conclusions which the author has drawn from her data, the editor has not the slightest doubt. We are justified in believing that geniuses, so called, are not only characterized in childhood by a superior I.Q., but also by traits of interest, energy, will, and character that foreshadow later performance. The ancient saying that 'the child is father to the man' probably expresses a truth far more profound than anyone has hitherto suspected. However, this must not be taken to mean that every child *inevitably* becomes the man he does become. If such were the case, education would be powerless to help or hinder. It does mean that the traits which make for prodigious performance in manhood are probably in evidence as budding capacities in the child. Whether, on the other hand, these capacities which we find in the gifted children about us are destined to flower and fruit will probably depend upon a host of circumstances, many of which, let us hope, are under the control of school and home, and other institutions of society." (p. ix)\*

\* From Cox, C. M. *Early mental traits of three hundred geniuses*. Stanford Univ. Press, 1926.

A summary of the findings with regard to the early behavior of eminent men should prove interesting to the reader. Since there were no actual mental test records of the geniuses studied, Terman and Cox ingeniously devised schemes for estimating the I. Q.'s of their talented Subjects by searching in biographical literature for all references to early mental performances which would serve as an index of mental level.\* Such data are to be found in records of vocation of fathers, early precocity of child, progress at school, kind of school to which individual was admitted, age of graduation, academic achievements, creative output in literature, art, science, invention, and other fields of activity. Knowing how performance along these various lines correlates with I. Q., these investigators felt justified in working backward and, from the available evidence, in estimating an "I. Q."

In Cox's study three judges made an I. Q. estimate for each individual studied, and the mean I. Q. was taken as most nearly correct. The crudeness of such a method is almost self-evident, and the reliability of the resultant "I. Q.'s" (especially when obtained from three judges, all of whom seem to have had the same biases) cannot be taken as equal to an I. Q. obtained by exact testing. The authors have attempted to meet the difficulties inherent in their material by offering for each "guess" an indication of the reliability of the data from which the "I. Q." was drawn. The results are more interesting for comparative purposes *inter se* than for comparison with test results obtained on modern children. Other than test data lend themselves better to general comparisons between the departed and the "expected" geniuses.

Cox and her co-workers looked for such traits, other than "brightness," which seemed to contribute to later high achievement. Their third line of questioning traced the hereditary background of the 301 geniuses studied, and the environment which had fostered the mental development of these geniuses.

Their conclusions with regard to youths who achieve eminence are briefly set down: 1. These "geniuses" had in general (a) a heredity above the average, and (b) superior advantages in early

\* Cox's research was suggested by Terman's (1910) study of Galton, reported in 1917. It is satisfying to us that the first analysis of this sort should have been made of Galton, the originator of "historiometry," a method christened by Woods. Terman's data, taken from K. Pearson's "*Life, Letters and Labors of Galton*," Vol. I, give ample evidence that Galton was a boy of unusual attainments and that he was extraordinarily precocious. Terman writes:

"From evidence given, one is justified in concluding that between the ages of three and eight years, at least, Francis Galton must have had an Intelligence Quotient not far from 200; that is, his mental age at that time was not far from double his actual age." (p. 209)



environment. 2. They were distinguished in childhood by behavior which indicates an unusually high I. Q. 3. They were characterized not only by high intellectual traits, but also by persistence of motive and effort, confidence in their abilities, and great strength or force of character. (p. 215 ff)

For details of the precocious activities of the three hundred geniuses selected for study, the interested reader is referred to Cox's volume. (30) Of chief interest to us at this point is the fact, not whether or not these geniuses may at times have fallen short, but that they were able to reach so high a pinnacle in their earlier attainments.

### C. LIMITS SET BY INTELLIGENCE TO VOCATIONAL SUCCESS

Fascinating as are such accounts of the activities of young genius at work and at play, it is just as illuminating to turn to the other extremes of intelligence; namely, the dullards, the morons, and even the lower grades, to note there an equally close parallelism between intelligence and achievement. At these low levels, we are confronted with the *limits* set by mental ability in attaining success (ability to hold a job over a reasonable period) in vocational fields.

Bridges and Coler (11) determined the *minimum* mental ages at which success in various trades could be achieved; for printing, a minimum of twelve years, three months, was needed; for tailoring, a minimum of seven years, six months; for laundry, eleven years, ten months; for duties of office boy, thirteen years was required. This study was followed by another in 1923 when Tagg (168) published minimum mental requirements for the metal working trades. Fryer (53), revising Army data, worked out average Alpha scores and range of scores for ninety-six different occupations, showing an increase in test levels with change from unskilled to highly skilled vocations.

Burr (20) reported a study of low level individuals and their subsequent economic adjustment. She studied the placement of 375 girls in industry. Using as a criterion of success the girls' ability to hold a job for three months, Burr determined the *minimum* intelligence required for successful performance in each of many jobs opened to her girls. For example, girls of Mental Age seven years, six months, were able to pack small articles, not easily damaged in handling (such as inserting powder puffs in oiled papers); but were unable to separate, fold, and pack hair nets, the latter operation requiring an M. A. of nine years, nine months. The lowest satisfactory level for stock-keeping, labeling and checking, was ten

years, five months; for machine operating, thirteen years, and so on for many other tasks. Unfortunately, Burr has not included a measure of the *variability* of mental levels to be found doing these various tasks successfully.

In connection with studies of efficiency in industry, it is to be noted that more than one worker has commented on the desirability of not having *too much* intelligence for a monotonous job. Active intelligence is apt to find routine work irksome; sluggish intelligence and a stolid personality are often essential to such success.

#### D. COLLEGE SCHOLARSHIP AND "SUCCESS IN LIFE"

It would be most illuminating to have comparative studies of minimum intelligence scores of men and women in high executive positions—in academic, business, professional or other fields of activity, and to note what part sheer intelligence has played in the vocational success of these individuals. But, unfortunately, such data are conspicuously lacking, due partly to the inability of the psychologist to reach these individuals. Unfortunately, also, most of these executives have left no records of intelligence test scores in the schools which they attended in a pre-test era; but it has been possible to secure records of the college scholarship of important people. Imperfect as the correlation is between intelligence and scholarship, nevertheless, college grades afford some clue as to individual differences in mental ability. Several studies have undertaken to compare later "success" with college standing. Vocational success has often been measured by income earned, but this in itself is often relative to the particular vocation followed; business, law and medicine being much more remunerative than teaching or preaching. (138) Sex discrimination against women has been another interfering factor in using absolute income as a measure of success. (59)

The earlier studies of Dexter (35) and Nicholson (127) used inclusion in "*Who's Who*" as a criterion of success in life. Foster (47) used judgments of college faculty members as to the later success of individuals who had graduated from their institution. Kunkel (104) and Bevier (5) required a number of men in each class studied to pass judgments on member graduates. Lowell (111) correlated grades in liberal arts with grades in later professional college. Walters (188) used representation on a standing professional committee within one of the engineering societies, while H. A. Smith (155) attempted to combine several of the above criteria. Of these several studies, reviewed by Finney (43), Gam-

brill's is the most thoroughgoing. Gambrill (59) analyzed her data by occupational groups, showing the representation from each quartile of scholarship.

TABLE 4

QUARTILE PERCENTAGES IN SCHOLARSHIP DISTRIBUTED ACCORDING TO OCCUPATION FOLLOWED \*

Occupation	No.	Percentage in each Scholastic Quartile			
		1st	2nd	3rd	4th
Business .....	67	21	24	22	33
Teaching .....	65	49	25	15	11
Law .....	34	26	35	18	21
Medicine .....	30	27	33	30	10
Engineering .....	20	35	30	15	20
Ministry .....	13	8	23	46	23

\* From Gambrill, 59, p. 35.

Inspection of the above data shows that the professions of teaching and engineering draw their highest percentage from first quartile men; law and medicine draw their highest percentage from second quartile men; the ministry from the third quartile; and business from the fourth quartile. Incomes run highest in law, second in medicine, through business, engineering, teaching, and lowest in the ministry. The correlations between income and scholarship were calculated separately for each occupation, but because of small numbers the sexes were combined. Her results led Gambrill to conclude that

"Scholarship seems to be a selective factor with reference to *vocation* to a considerably greater degree than with reference to success in a specific vocation." (p. 79)

Also, that

". . . the traits which lead to scholastic success are not in large measure the traits which register later in relatively high income within one's vocational group." (p. 41)

These conclusions seem to contradict the findings of the earlier workers, who, measuring success by a listing in *Who's Who*, found a regular high relationship with earlier scholastic standing. Gambrill points out that "general intelligence" is probably the common factor between high scholarship and a *Who's Who* listing, while certain other traits, varying for different occupations, are apparently more important for vocational success and earnings.

Finney (43), using income or professional earnings as an indication of success, was careful to allow for the fact that women in all occupations were paid less than men, and that failure to classify data by sex ". . . would lead unequivocally to the conclusion,



which probably not even the most ardent anti-feminist would seriously defend, that women in all vocations are uniformly less successful than any man in any occupation." (p. 57)

Her analysis shows that, sex for sex, the average incomes of Phi Beta Kappa members exceed that of non-members "... for the first (also for the fifth in the case of women) and the twenty-fifth years after graduation. This seems to demonstrate the superior 'staying' qualities of the honor student and to prove that over a long period of time, success even as measured by salary, without regard to occupational groupings, is more likely to come to the individual of high scholarship than to the one of mediocre or low standing." (p. 77)

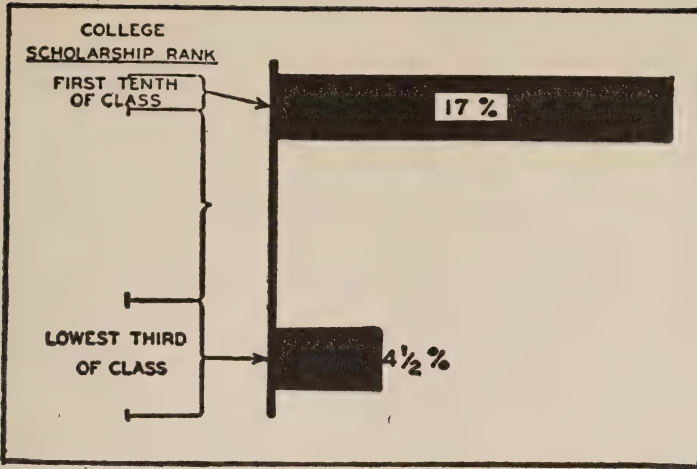
An interesting study published by Gifford (67) considers the earnings of 3806 men, all employed within one business, the American Telephone and Telegraph Company, although coming from 104 different colleges. It will be seen from Gifford's chart (Fig. 16, at the top) that those who ranked in the first tenth of their college scholarship (498 men) represented seventeen per cent of the highest salary group (in tenths) while the lowest third in their class (784 men) earned only four and a half per cent of the highest salaries.

The median salary of each scholastic group, determined for every fifth year after graduation, was compared with the median salary of the total group. The chart (Fig. 16, bottom) shows that these median salaries are consistent for original scholastic rank, and what is more interesting, that the differences become more pronounced with years of service. After twenty-five years, the high scholarship men are still going up in salary, while the low scholarship men are dropping. Thirty years of service finds the median salary of men in the first tenth of scholarship to be 155 per cent of the median salary of all employed; while the men in the lowest third of scholarship earn only seventy-nine per cent of the group median.

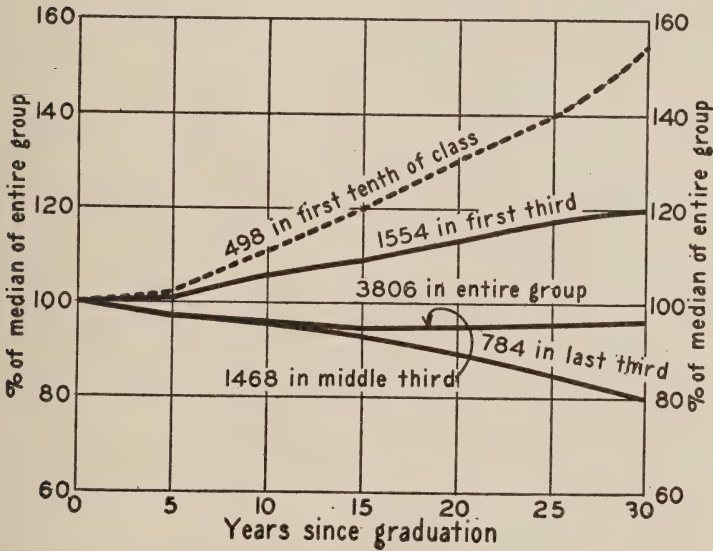
"The longer the best students are in business, the more rapidly their earnings rise. The longer the poorer students are in business, the slower their earnings rise." (p. 673)

"The man in the first third in scholarship at college, five years or more after graduation, has not merely one chance in three, but about one in two of standing in the first third in salary. On the other hand, the man in the lowest third in scholarship has, instead of one chance in three, only about one in five of standing in the highest third in salary. There is also nearly one chance in two that he will stand in the lowest third in salary." (p. 674)\*

\* From Gifford, W. S. Does business want scholars? *Harpers Magazine*, 1928.



Men from the first tenth of their college classes have four times the chance of those from the lowest third to stand in the highest tenth salary group.



The median salary of the entire group studied is shown by the horizontal 100 per cent line. Thirty years after graduation, the median salary of the men who stood in the first tenth of their college classes is 155 per cent, that of the men in the lowest third of their classes is 79 per cent of this median.

FIG. 16. SCHOLARSHIP GROUPS IN RELATION TO SALARY GROUPINGS. From Gifford, *Does Business Want Scholars?* *Harpers Magazine*, May 1928. Courtesy of *Harpers Magazine*.

The studies of Finney and Gifford both bring out the point that the higher intellects maintain and increase their earnings over a long period of time; that lower intellects suffer a drop with the years.

## VII. CONCLUSIONS

Prior to 1908 almost no professional techniques existed for detecting any but the dumbest among human beings, people at the level of the idiots and the imbeciles. Even at this level, fine distinctions of individual differences in intelligence were not possible.

The work of Binet and of others in the next ten years developed the concept of general intelligence and provided the basis for modern intelligence tests, graduated to specific ages, and standardized upon groups composed of individuals with a generally similar socioeconomic background.

In 1918 the World War provided a large scale laboratory for the trial use of intelligence tests in the United States. The immediate results were of practical value to the army; but later conclusions drawn from the army data did not take into account the limitations of the tests used, and for a time the whole testing movement in this country was under a popular and scientific cloud.

The decade since the war has seen great progress in the development and standardization of tests adapted for many different uses, but, more important, psychologists have learned the limitations of their tests, and the careless generalizations of 1920, or even of 1925, are no longer permissible. It is now recognized that all tests are highly charged with environmental content and that they offer a fair measure of individual differences only when used *within* groups having a similar environmental background. The use of the same test upon individuals with a different cultural, social, educational, economic, or national background, does not give a reliable result, and all interpretation of the many studies which have been made with such tests as a basis must be put forward with great caution.

When, however, their application is limited to groups or individuals with backgrounds similar to that of the group upon which the test was standardized, then we may say that tests have been perfected within the last two decades to a point where they are highly valid and reliable for detecting individual differences in "general intelligence." Equally valid and equally reliable are tests of certain specific abilities, such as music, art, mechanical ability,



*etc.* But the detection and measurement of separate mental "traits" or of separate functions of the mental process (whose combined functioning make up the composite "general intelligence") must await further research.

Beginnings in the detection of independent mental traits have been made from two points of view: (1) the statistical isolation of independent variables in the composite "general intelligence," and (2) the study of maturation rates of different mental and motor functions or activities. Individual differences in strength of several "unique traits" (of the kind reported by Kelley and Spearman), and differential development in mental and motor sequences, or patterns of behavior (of the sort studied by Shirley and Greene) should afford significant clues to the student of mental inheritance on the alert for innate mental differences.

Adequate measuring tools, here as elsewhere, are needed to measure growth and change. The psychologist offers adequate tools, but at the same time sounds a caution that these tools and tests must be used only in the light of knowledge of all factors involved in interpretation of obtained measurements. Such caution takes into account: conditions which affect the development of intelligence; conditions which affect test scores; conditions which render the selection of certain tests as valid or invalid to the group on whom they are to be applied; a knowledge of the validity and reliability of the tests, based on their own standardization data, and insight into other than qualitative results obtained by test, which should be correlated with test findings.

In spite of their established prognostic value, tests still suffer from certain weaknesses which in time will be corrected through more careful statistical analysis on the part of test constructors. Tests are charged at times with being "unfair" to the slow reacting individual, because speed is often stressed; with being a handicap to the foreign-born, because of the verbal content; of giving unfair advantage to the socially well born and disadvantage to the lowly born, because test materials depend too much on schooling and culture; but, most of all, tests are criticized because they do not discriminate adequately among high level individuals in predicting "success in life."

For a long while to come, tests will remain better measures of what people can do than of what they will do. There are many highly intelligent people who lack other qualities essential to success, and there are others destined for later distinction who may not be discovered by intelligence tests today; and, too, there are

intellectual functions (*e.g.*, managing people) that are not yet adequately measured by tests. Granted that personality may make or mar a career, and that a fine intelligence may mean little if "blocked" emotionally; granted all this, the psychologist still offers the scores on mental tests as the best single evidence obtainable on the intelligence of human beings.

#### RECOMMENDED READING

*Books which discuss in general the theory and practice of intelligence testing*

Dearborn, W. F., 1928. *Intelligence tests: Their significance for school and society*. Boston: Houghton, Mifflin. Pp. 336.

Freeman, F. N., 1926. *Mental tests*. Boston: Houghton Mifflin. Pp. 503.

Peterson, J., 1925. *Early conceptions and tests of intelligence*. Yonkers: World Book. Pp. 320.

Pintner, R. (Rev. Ed.), 1931. *Intelligence testing: Methods and results*. New York: Holt. Pp. 555.

Thorndike, E. L., with others, 1926. *The measurement of intelligence*. New York: Teach. Coll. Bur. of Pub. Pp. 616.

*Books which offer direct information with respect to the use of specific tests: manuals, handbooks, bibliographies, etc.*

Bronner, A. F., Healy, W., Lowe, G. and Shimberg, M., 1927. *A manual of individual mental tests and testing*. Boston: Little, Brown. Pp. 287.

Burt, C., 1921. *Mental and scholastic tests*. London: County Council. Pp. 432.

Hildreth, G., 1933. *Bibliography of tests*. New York: Psychol. Corp. Pp. 242.

Pintner, R., and Paterson, D. G., 1917. *A scale of performance tests*. New York: Appleton. Pp. 218.

Schieffelin, B., and Schwesinger, G. C., 1930. *Mental tests and heredity*. New York: Galton Pub. Co. Pp. 298.

Terman, L. M., 1916. *The measurement of intelligence: An explanation of, and a complete guide for the use of the Stanford revision and extension of the Binet-Simon Scale*. Boston: Houghton Mifflin. Pp. 362.

Wells, F. L., 1928. *Mental tests in clinical practice*. Yonkers: World Book Co. Pp. 315.

Yoakum, C. S., and Yerkes, R. M., 1920. *Army mental tests*. New York: Holt. Pp. 303.

*Books which discuss the statistical bases underlying use and interpretation of tests and measurements*

Kelley, T. L., 1928. *Crossroads in the mind of man: A study of differential mental abilities*. Stanford University: Stanford Univ. Press. Pp. 238.

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*Journals which discuss the theory and practice of intelligence testing*

- J. of Applied Psychology*. Baltimore: Williams and Wilkins Co. Bi-monthly.
- J. of Educational Psychology*. Baltimore: Warwick and York, Inc. Monthly. "Devoted primarily to the scientific study of problems of learning and teaching."
- J. of Genetic Psychology*. Worcester: Clark Univ. Quarterly. Reports experiments on child behavior, often involving use of tests.
- J. of Social Psychology*, Worcester: Clark Univ. Press. Quarterly. "Political, racial and differential psychology."
- Genetic Psychology Monographs*. Worcester: Clark University Press. Monthly. Each issue reports a complete research, frequently on child behavior.
- Mental Measurement Monographs*. Baltimore: Williams and Wilkins Co.
- Psychological Review*. Princeton: Psychological Review Co. Bi-monthly. General psychology.



*Psychological Monographs*. Princeton: Psychological Review Co. No regular dates. Each issue is the report of one or more experimental projects.

*Psychological Clinic*. Philadelphia: Psychological Clinic Press. Reports individual cases and tests.

*J. of Educational Research*. Bloomington Pub. Sch. Pub. Co. Monthly.

*The Personnel Journal*. Baltimore: Williams and Wilkins Co. Monthly.

*School and Society*. New York: Science Press. Weekly. Includes general and non-technical reports on use of tests and measurements in the schools.

*Teachers College Record*. New York: Teachers Coll. Bur. of Pub. Monthly. Contains frequent reports on projects involving use of mental measurements.

*British Journal of Psychology*. (Gen. Sect.) London: Cambridge Univ. Press.

*Archives of Psychology*. New York: Science Press. Reports doctoral dissertations. Irregular.

*Teachers College Contributions to Education*. T. C. Bureau of Publications. Each report a separate issue, usually doctoral dissertations.

*Harvard Monographs in Education*, and similar publications from other leading universities which report their researches. These often include extensive use of new and old tests.

*The following will be found very useful in locating pertinent psychological literature*

*Psychological Abstracts*. Eno Hall, Princeton.

*Psychological Index*. Princeton: Psychological Review Co. Yearly index and bibliography of published literature. International.

*Psychol. Bull.*, especially the issues of: 1926, 23, 366-381; 1927, 24, 391-408; 1928, 25, 389-406; 1929, 26, 381-396; 1930, 27, 431-457; 1932, 29, 93-119. These are yearly summaries of current contributions in the field of intelligence testing.

#### CENTERS FOR INTELLIGENCE TESTING IN AMERICA

American Council on Education, Washington, D. C. Under Dr. C. R. Mann.

Department of Research and Test Service. World Book Co., Yonkers, N. Y. Dr. A. Otis.

Division of Research, Minnesota State Department of Public Instruction, Minneapolis, Minn. Under Dr. F. Kuhlmann.

George Peabody College for Teachers, Nashville, Tenn. Under Dr. Joseph Peterson. Interested in developing tests for whites and Negroes.

Graduate School of Education, Harvard University, Cambridge, Mass. Under Dr. W. F. Dearborn. Interested in test development and growth study. Dr. T. L. Kelley. Statistics.

- Institute of Educational Research, Teachers College, Columbia University, New York. Under Dr. E. L. Thorndike. Studies in the nature of intelligence; tests.
- Judge Baker Foundation, Boston, Mass. Under Drs. W. Healy and A. F. Bronner. Developing individual tests.
- Princeton University, Princeton, N. J. Department of Psychology. Under Dr. C. C. Brigham. Studies and analysis of test items, scoring, *etc.*; international tests.
- Stanford University, Stanford University, Calif. Department of Psychology. Under Dr. L. M. Terman. Statistical studies of the nature of intelligence and standardizations of tests; gifted children.
- Teachers College, Columbia University. Department of Psychology. Drs. R. Pintner, W. McCall, and H. A. Ruger. Tests, educational measurement, statistics, and development of puzzles, *etc.*
- University of Chicago, Chicago, Ill. Dept. of Education. Under F. N. Freeman. Studies of the nature-nurture theory, educational tests, *etc.*
- University of Iowa, Iowa City. Under Dr. C. E. Seashore. Studies of special abilities, art, and musical talent.
- University of Minnesota, Minneapolis, Minn. Department of Psychology. Under Drs. Paterson, Elliott, *et al.* Studies of mechanical ability.
- University of Pennsylvania, Philadelphia, Pa. Under Drs. L. Witmer, M. Viteles. Studies in test development for clinical and vocational guidance uses.
- Vineland Training School, Vineland, N. J. Under Dr. E. A. Doll. Research in feeble-mindedness.

*Centers interested in test development for children of preschool age*

- Child Welfare Station, University of Iowa, Iowa City. Under Dr. George Stoddard.
- Clinic of Child Development, Yale University, New Haven, Conn. Under Dr. A. G. Gesell.
- Institute of Child Welfare, University of California, Berkeley, Calif. Under Dr. H. E. Jones.
- Institute of Child Welfare, Univ. of Minnesota, Minneapolis, Minn. Under Dr. J. E. Anderson.
- Institute of Child Welfare Research, Teachers College. Columbia University, New York. Under Dr. L. H. Meek.
- Merrill-Palmer School, Detroit, Mich. Under Dr. E. N. White.
- St. Georges' School for Children, University of Toronto, Toronto, Canada. Under Dr. W. E. Blatz.

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## CHAPTER II

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## I. HISTORICAL INTEREST

### PRESENT-DAY RESEARCH

Human beings have made observations on human nature since the beginning of time. The Bible, especially the book of Proverbs, is replete with shrewd analytical remarks on the conduct and character of man. The ancients under Aristotle, Theophrastus, Hippocrates, Galen, and others, have left records of their peculiar interest. Galen, in particular, is responsible for the development of the theory of "humours" into its four-fold classification of temperament: Melancholic, phlegmatic, choleric, sanguine. This theory influenced thinking for centuries, was finally discarded, and only of late seems to be coming back through another door in the recent efforts to show how glands regulate personality (15, 16). For a summary of the endocrine movement in general see Lipschütz. (97)

In 1808 appeared the beginnings of the phrenological school, which tried to link personality traits with cranial protuberances, a theory based on a "faculty" psychology and a belief in the "localization of brain functions." This school, sponsored by Gall and Spurzheim, together with the advance of physiognomy, supported by Lavater, was launched as a science on a naïve world, and so great an influence did it exert, at least as a pseudo-science, that even today its popular strength is not greatly shaken. At present, and springing more directly from the clinical findings of Kraepelin, as to forms of mental disease, modern German psychiatrists, perhaps the most outstanding of whom is Kretschmer (86-88), are conducting extensive scientific investigations on the relation of personality types to certain bodily structures,—the slight, the athletic, the muscular, the plump, the undersized, and so on. The work on the "constitutional" basis of personality has been reviewed by Bogen. (20) It is also discussed in our Chapter V.

The attempt to correlate psychological traits with physical make-up presents a common meeting ground for anthropology and psychology, and was reflected in Galton's proposals to the British Association for the Advancement of Science (44, 45) to pursue a scientific inquiry into "the groups of men who are sufficiently similar

in their mental characters, or in their physiognomy, or in both, to admit of classification." (pp. 344-5.) Galton (139), however, "did not take the trouble to differentiate between intelligence and character, lumping under the latter head everything with regard to which individuals might differ from one another: Intelligence, reactive functions, temperament, and even physical qualities." (p. 144)

The first elaborate statistical study of character traits, based on data from biographies and questionnaires, was made in 1906 by Heymans and Wiersma (195) in Holland; the first official "character test" appeared in 1912, the work of an American, G. G. Fernald (35), who published a set of questions designed to measure "moral consciousness."

Other influences of recent years which have accentuated popular interest in character analysis, grew out of the personnel movement, concerned chiefly with vocational placement and its corresponding need for quick efficient classification, based on the discovery, not only of the applicant's special abilities and skills, but also of his character and temperamental traits. About this time, also, the psychiatrist and psychoanalyst stressed the importance of understanding personality. Mental hygiene, in line with other aspects of preventive medicine, succeeded in rousing the interest of educators towards developing character curricula in many of the public schools, which movement, in turn, resulted in personality being taken up as a definite field for research. Then followed a realization of the need for tools and instruments to measure character. As Lentz (95) says: "Character education without character measurement would appear to be as logical as target practice in the dark, good shots and poor ones being equally gratifying." (p. 2.)

Character testing was at first incidentally undertaken in the work of Voelker (177), and later most systematically and energetically in the experimental researches of the Character Education Inquiry. This famous Inquiry, launched in 1924 by the Institute of Social and Religious Research, in coöperation with the Institute of Educational Research of Teachers College, Columbia University, under the general supervision of Professor E. L. Thorndike, projected an extensive five-year investigation into measurement, methods, and techniques in the field of personality, largely in the field of "moral character." The work was directed by Hartshorne and May (55-60), who defined their area of investigation as a study of "behavior in relation to ideas, purposes, motives and attitudes of the individual and group to which he belongs." (57) Their project was considered from a four-fold point of view: 1. Mental content

and skills (intelligence factors), 2. Desires, opinions, attitudes, motives (so-called dynamic factors), 3. Social behavior, conduct (performance factors), 4. Self-control, relation of these factors to one another and to self-integration. Later (pp. 118 ff), we shall discuss tests by the Inquiry to cover each of the above divisions.

The work of the Inquiry was officially closed in 1929, but the interest of the investigators, May and Hartshorne, now both of Yale, will no doubt continue to express itself through the channels of the Yale Institute of Human Relations, of which Dr. May is Executive Secretary.

A second active center in personality investigation is to be found in the department of psychology at Harvard University under Dr. G. W. Allport, who with his brother, Dr. F. H. Allport, now of Syracuse University, was one of the first important contributors to the field of character study. (2)

In Teachers College, Columbia University, Dr. G. B. Watson (178-191) is actively interested both in the theoretical problems of character education and character measurement, and in developing a consultation clinic for problem personalities who can come for a personal conference. References to the many workers in the field of study cannot be included here, but some may be found in the supplement at the end of this chapter (pp. 144-45).

Leaders abroad include Stern of Hamburg, Germany (151-153), who stresses the "psychological unity" of the individual, and Köhler (82), leader of the "Gestalt" school; of the various "type" schools we might mention Kretschmer (86-88) as seeing a relationship between psychological make-up and body build, and Jaensch (67, 68) who connects constitutional make-up with the tendency to have or not to have "eidetic imagery," and Spranger (150) who has described six basic types. We might refer also to Jung of Zurich (71), founder of the extroversion-introversion concepts; to Wiersma of Holland (195, 196) for the activity-emotionality types, and to Spearman of London (149) on perseveration. Other workers and approaches are discussed in our Chapter V on viewpoints (pp. 353 ff) in regard to the development of personality.

An important approach to the study of personality which cannot be overlooked, even in brief review, is the work now being done on preschool children in various university centers in America. Details of this approach will be discussed later (pp. 110-14), and important centers and leaders are set down in the supplement at the end of this chapter (page 145).

Even the most casual inspection of the above references will



disclose the extreme recency of their contributions. Until around 1920 Psychology had little or nothing to offer in the way of objective measurements of personality. Only too painfully aware of how inadequate that bit was, psychologists have sought, and are still seeking, industriously and statistically, to improve on their earlier efforts. Although only a few outstanding leaders have been mentioned above, there are hundreds of psychologists at work, both in America and abroad, scanning new contributions, initiating and verifying experiments and researches, devising new tools of measurement, meeting in conferences, conventions and colloquiums, publishing reports, writing articles, and energetically pushing the cause along. The number of books and articles alone which have been written on the scientific aspects of personality measurement within the last decade is well into a second thousand, with no suggestion of abatement. Intellectual traits were not at first easily measured; personality traits are even more elusive; in fact, they may not exist at all as discrete characteristics, and until the psychologist has settled this question, the eugenist will have to be content with what measuring tools the former grudgingly offers him in the field of personality.

## II. DEFINITIONS OF PERSONALITY

Each modern writer on personality has his own definition of it; he also usually draws distinctions between the three terms which, historically, have been used more or less interchangeably: Character, temperament, and personality. For a comprehensive list of definitions the reader is referred to the Proceedings of the Second Colloquium (136); here, only a few will be offered to illustrate different points of view.

Popularly considered, "character" has an ethical-moral connotation. For example, "He is a man of good or bad character." "Temperament" is a matter of "internal constitution," and personality is "that which constitutes distinction of person, individuality"; as, for example, "a striking personality." (Webster's Dictionary)

Etymologically, personality is derived from the Latin "*personare*," to speak through a mask; or, in drama, to play a part. Hence, a person is known only as he reveals himself in speech, action, or other modes of expression.

Psychologically considered, definitions of personality range from the superficial or popular, to the most involved, deep-hidden psy-

chiatric conception which takes account of complexes, urges, drives, integration or lack of it, and so on. In testimony to the difficulty of analysis, we quote Burnham (24): "What personality is, everybody knows; but nobody can tell."

The layman is usually concerned with the externality of the person; his dress, his voice, his gestures, his manners, his motor-coördination, his charm, his versatility—any reactions, in fact, which are socially important. Roback (139) brings out the distinction between this view and that of the psychologist:

"It is evident that in due course, the charm of these physical qualities wears off for the friend of long standing, and the deeper or inner personality begins to stand out. It is therefore this phase of personality which should claim our attention rather than its superficial aspect." (p. 159)

The psychologist, however, does not exclude the social viewpoint. F. H. Allport (1) holds that:

"With the exception of a few traits, personality may be defined as the individual's characteristic reactions to social stimuli, and the quality of his adaptation to the social features of his environment." (p. 101)

May (106) states:

"Personality is that which makes one effective or gives one influence over others . . . it is one's *social stimulus value*."

. . . "An individual's personality is not defined wholly by his responses to others but also by the responses others make to him as a stimulus. It is these responses made by others to the individual as a stimulus that define his personality. (p. 82-3)

If the individual is weak, he has small effect on others; his presence or absence in a gathering will make but little difference; if he is strong, that is, if he has considerable effect on others, he has "more personality."

G. W. Allport's (6) point of view is genetic:

"Personality is a *psychological* organization under cultural, physical, bacteriological and hereditary influences." (p. 732)

In 1921, the Allports (2) reviewed many definitions of personality, all largely concerned with enumerating components of personality. In 1930 Allport and Vernon (9) added new definitions, reflecting new approaches and points of view. As they point out (p. 681), the various definitions may be placed in a continuous series from the most outer (bio-social) to the most inner (bio-physical) conceptions of personality.

### Character

Character, as a term, is sometimes used as denoting that field of human behavior which involves conformity to conventions, ethical and moral standards. J. B. Watson (192) tells us that character is really included in the term personality. The individual's reactions to conventions, morals, *etc.*, in short, his ethical behavior, constitutes his character. Hence it follows that liars and thieves while rating low in character may have most interesting personalities. (p. 422)

Again, character is reserved to indicate that aspect of personality concerned in *action*. After reviewing the contributions of centuries, Roback (139) offers as his own definition of character. ". . . an enduring psychophysical disposition to inhibit instinctive impulses in accordance with a regulative principle." (p. 450)

Filter (37) explains that:

"The emphasis is upon the force of activity rather than upon its direction, upon the quality of behavior, in terms of strength, persistence, readiness, rapidity, *etc.*, rather than upon its value as right and wrong, good or bad, wise or foolish, *etc.*" (pp. 323-4)

Since the word character is sometimes used interchangeably with temperament and personality, Allport and Vernon (9) advise discontinuing its use as a psychological concept.

### Temperament

There is less disagreement among psychological conceptions of temperament. The definitions, in this case, usually stress the affective or emotional side of personality; many attempt to relate such emotion to physiological bases, largely in the vital organs. For instance, McDougall (116) thinks that temperament is:

". . . the influences, direct or indirect, of bodily metabolism (more especially of the endocrine secretions) upon the psycho-physical processes of the nervous system." (p. 294)

Rayner (137) gives an historical account of this phase of study. Accounts are also supplied by Pieron (129), Kempf (76), Berman (15, 16) and Lipschütz (97). The "will-temperament" of Downey (33, 34) is concerned with the individual's characteristic overt reactions—whether he is energetic or weak, prompt or slow, persistent or vascillating, cautious or reckless, and so on.

F. H. Allport (1) stresses, as underlying temperament, three dimensions of the emotional level: (a) The frequency and change from one emotional mood to another; (b) the emotional breadth—



the "range and variety of objects which arouse one's emotions," and (c) the emotional strength or "depth" of reaction when stirred. Allport also stresses the characteristic mood and attitude which tend to accompany the thoughts and actions of people. McDougall (117) has recently offered his analysis of the three terms: character, temperament, and personality. To him personality is analyzable into five factors: intellect, character, temperament, disposition, and temper. (p. 15)

In general, then, it may be said that all definitions seem to consider temperament a matter of emotional balance, of characteristic modes of reaction, and because more closely associated with physiological make-up, less susceptible to modification than other aspects of personality; for this reason then, temperament would be of more interest to the eugenicist.

In this chapter we shall consider under the term personality only those "non-intellectual" aspects of the human being which fall within the psychological field, omitting the intellectual chiefly because we have already devoted a chapter to it. We shall not be so much concerned as to where the boundary lines between character and temperament and even intelligence fall, for indeed they must, at times, so overlap and dominate one another that a clean cut division, classification, or definition becomes out of the question. The term personality will include such aspects or qualities as traits, attitudes, preferences, interests, moral judgments, social sense and adjustment, conduct reactions, emotions, temperament and the like. In no sense does our arrangement imply that the intellect is not an enormous component of the total personality.

Characteristically enough, American psychologists have not definitely clarified their conception of personality before plunging into the task of measuring it. Attempts at analyzing personality through tests have yielded an almost chaotic array of results, with none of the uniformity of findings which characterized the earlier efforts to measure intelligence. The only common element in the various researches is a realization of the enormous difficulty of the problem.

### III. THE PROBLEM OF ANALYSIS: ITS DIFFICULTIES

#### A. PERSONALITY, ESSENTIALLY A BALANCE, RATHER THAN AN ACCUMULATION

Thorndike's axiom, that "Whatever exists at all, exists in some amount," (164) may have given rise to a false start in the analysis

and measurement of personality; especially so, in that this axiom seems so fundamental an approach to the study and measurement of intelligence. Theoretically, it is quite possible to conceive of zero quantity of general intelligence, or of an intellectual trait or process; and by successive increments of this general fund or of some special function, to achieve a higher and higher degree; in the sense of "the more the better." But in the field of personality a "trait," even empirically conceived, is not a uni-dimensional matter. When any such trait is thought of by name, as, for example, "modesty," "ambition," "self-control," "suggestibility," one has in mind apparently only *a certain degree of expression* or development of that trait. It is not so much "Whatever exists, exists in some amount," but rather, "When the amount is excessive, or inadequate (more or less than a certain assumed amount) the trait ceases to exist and becomes something else"; as, for example, "leadership" merges into "tyranny," "suggestibility" into "submission"; "dignity" into "snobbishness" at one end, "clownishness" at the other; "self-confidence" into "bumptiousness"; "reserve" into "timidity"; "tact" into "bluntness" or sheer "spinelessness," depending on the direction. Here, extremes are likely to become odious; one wonders if any trait, expressed at its maximum or minimum quantitative extreme, is ever desirable!

If a generalization could be made, it would seem that a "middle of the road," a "Golden Mean" should be the standard or norm to be sought after. Again, such a principle cannot be made to hold; for in the mesh of personality, the appearance, weighting, and worthwhileness of any trait is surely a relative matter; relative to the rest of the personality make-up as well as to the situation. "Ambition" in a moron may have to be curbed; in a person of high intelligence to be stimulated; the modesty or "withdrawnness" of the schizophrenic to be replaced by a little "assertiveness"; and the "vain-gloriousness" of the boaster to be subdued in the direction of the mean. It is also relative to the importance of the situation to be stubborn on a minor issue, and weak-willed on a matter of major importance; conditions surely not to be preferred to compromise or surrender in one case, and firmness in the other.

Thus it will be seen that while intelligence may be roughly held as an accumulation of abilities, or a certain point on a scale from "very little to very much," personality cannot be considered from any such additive point of view; nor can its "value" be expressed by any numerical concept, comparable with the I. Q., the index of brightness.

## B. INCONSTANCY OF TRAITS

A second difficulty lies in the relative inconstancy of any behavior reaction within any one individual. Bain (12) points out: "All measurement, and hence all exact science, depends upon relative stability and uniformity in the behaviour of defined units." (p. 362) The unit of personality is hard to define, and the behavior of the individual is not consistent from one situation to the next. In the field of emotion, the man who is angry today may be affable tomorrow; in the field of morals, the chicken thief may never steal anything else; the radical on religion may be conservative on domestic conventions. Chance alterations of mood, or slight differences in the elements of the situation bring about changed responses. Traits which have been popularly regarded as unitary phases of behavior have, when investigated by psychological research, an aggravating way of being inconsistent with themselves in different settings. The man who is cautious with his money may be reckless with his time; the boss in the factory may be the hen-pecked husband at home. Like the "faculties" of an older psychology, these popularly conceived traits do not cohere as general modes of behavior according to our logical classification of them; often indeed, they seem rather to be merely specific responses to specific situations, which because of a certain common reaction running through them can be classified into "similar" groupings; when responses to such situations are different from, or opposite to, the "expected" or "characteristic" response, our predictions are seen to be worthless. As an illustration: If we feel assured of the intrinsic "honesty" of our friend, through having experienced evidence of it over a period of years, we are nettled to find that he has failed to pay his car-fare on a certain occasion when the conductor passed him by. G. B. Watson (184) incorporates our confusion in regard to his "honesty" in the following explanation:

"Evidence accumulates to show that, although the English language may have bound certain responses together into one name, the responses remain really separate, and the presence of one does not indicate the presence of another." (p. 301)

The above example of a traditionally pre-conceived "psychological trait" may not be the same to all men. Not paying carfare may be out of the complex organization of "honesty-cheating" and be a part of another organization, *e.g.*, cunning, shrewdness, *etc.* The trait "honesty" is further complicated because we have endowed it with a moral connotation. Morals, *mores*, customs, are an out-



growth of social culture rather more than of innate human nature, as variations in time and place attest. Hence, although the existence of a psychological trait does not debar its having been socially conditioned, the psychologist must be on guard against confusing moral qualities with psychological traits; they may or may not coincide, *e.g.*, the traits of "ascendence-submission" contributed by Allport (2) are in themselves neither moral nor immoral, whereas, the traits of "honesty-deceit," studied extensively by May and Hartshorne (55-60) cut directly across our conventional ethics. Less easy to classify are the traits of "radicalism-conservatism" studied by Allport (2), Vetter (176), and Likert (96), these traits being socially applauded in some circles, and socially condemned in others. The social attitude toward them may govern their expression in any individual at any particular time; may at least govern his admission of their existence in his own personality make-up.

However, even though moral traits are, as Folsom (41) reminds us, "products of conventional ethics, not of analysis of the fundamental behavior of organism," and "creations not of biology, but of law and custom," their establishment within any one individual may be so ingrained, as to constitute a determinative mode of reacting within that individual. In this instance, perhaps, they may be considered as "traits" or dynamic drive, modes of reaction, which are aroused through the application of specific stimuli, *e.g.*, some people are *compelled* to be honest on all occasions, even at great expense to themselves. On the other hand, even when lapses of a trait expression are noted, this does not necessarily prove the non-existence of the trait, for, as Allport (8) points out, (1) there may be contradictory traits within one person, *e.g.*, a tendency to be both neat and careless; (2) any one act may perforce be more related to the situation of the moment than to the general existence of the trait within the individual; and (3) a major trait in one personality may be a minor one, or even non-existent, in another personality. And as Allport holds, traits are after all only relatively independent of each other, since the organism tends to act as an integrated entity, thus necessitating the reduction of several traits into a "final common path."

Other criteria for the existence of a trait, besides its empirical recognition in the history of an individual, are that it may be isolated statistically in the population at large, and comparison made as to individual differences. This procedure has been carried out by Likert, Allport, and Vetter, who are all able to show evidence of obtaining "repeated reactions of a constant type" which seem to

be functions of the same "underlying determinant" in different individuals.

Allport (8) defines a trait as a "generalized response unit in which resides the distinctive quality of behavior that reflects personality" and having (regardless of whether it has been socially or natively produced) the same existence that a complex habit has, but being more generalized than a habit, *e.g.*, domination in various situations.

Elsewhere, Allport (5) insists that a trait must be considered as "functionally independent of its origins"; must be recognized by its fruits and not by its roots, *i.e.*, as a behavior determinant. Here he defines a trait as "a general and habitual mode of adjustment which exerts a directive effect upon the specific response." In any given situation behavior will be determined by the "complex higher units of personality" as well as by the exciting stimulus. He refers to the positions of Roback and Spranger and Young who hold that the center of gravity in a personality lies in the *values* held by the person. However these values may have been set up within the individual, Roback holds that there is "an inborn urge to consistency which forces the individual to strive toward unification in his acts." The degree to which this urge is realized by different people varies. Hence integration in personality is a matter of degree.

Opposed to this point of view of the existence of general tendencies to behave in a certain pre-determined way (origins not taken into account) is the "doctrine of specificity" which holds that human behavior varies as the situation varies, and that conduct is more closely connected with the situation than with the Subject's inner mechanisms. A slight change in the situation changes the response. To quote May (1936) the leader of this line of thinking:

"Stated in a very extreme fashion, the contrast between this theory and the inner mechanism theory is that the situational theory holds that when the situation is varied, the response is varied, even though the inner mechanisms remain constant; whereas the inner mechanism theory holds that when the inner urges or motives or instincts, or what not, are varied the conduct is varied even though the external circumstances remain the same. But here again the questions at issue are not settled because the necessary facts are unavailable." (p. 97) \*

Nevertheless, as a result of their researches on deceit, Hartshorne and May insist that there are honest and dishonest acts, and not

\* From May, M. A. The foundations of personality. In *Psychology at work*, edited by P. S. Achilles. McGraw, Hill, 1932.

honest and dishonest persons. They insist on the "specificity of conduct" as a fundamental fact. Their conclusions were deduced from data secured on "children in general" (based on a low intercorrelation between certain "conduct tests" each employing different techniques). For honesty they used nine tests which intercorrelated .227 (57, II, p. 125). This coefficient when corrected by the Spearman-Brown formula is raised to .725 which is high enough to stimulate May and Hartshorne into predicting how many tests would be needed to cover the entire honesty area, assuming thereby the existence of such an area. Similarly, a larger number of tests for "service" and "self-control" would enable them to cover these areas of behavior. Apparently then, the "generality" of a personality trait is in direct proportion, statistically at least, to the number and validity of tests used to uncover its existence. A very slight shift in one's attitude of interpreting the May-Hartshorne data would show prominent and significant general factors as running through their whole battery.

The problem of individual differences in "integration of honesty," that is, the ability of each child to withstand the temptation of each specific situation among many presented, led the investigators (59) to conclude that ". . . there are genuine and significant differences among children in amount of integration, but the average integration is rather small. . . ." (p. 307); and "The doctrine of specificity holds for children in general but holds with very different force for different children."\* (p. 308)

Almost as staunch a supporter of the doctrine of specificity is Symonds, whose position will be presented in his own words (158):

"Do we 'traitify' human experience by our methods of measurement? Do we assume from a method of measurement whereby we ask a number of questions and then proceed to total the answers so as to yield a total score that there is something in human nature that corresponds to this score? It must be admitted that this is oftentimes the case. It is easy to fall into the trap of first positing a trait, such as persistence or dependability, analyzing the trait into a number of specific situations in which it might manifest itself, framing these in question form, and finally computing a score on the basis of answers which indicate the presence of the trait. This method makes the unwarranted assumption first of all that the trait actually does exist.

"One must be constantly on his guard in measurement not to create falsely by the very names which he gives to his tests a fictitious rel-

\* Interesting enough was the high coefficient of intercorrelation (corrected  $r$  was .776 (59, p. 319) between integration of honesty and honesty itself; which means that the children who were most honest on separate situations (*i.e.*, got the highest scores on honesty tests), tended to be most consistently honest through the whole battery of situations.



evance or significance which they do not actually have. Psychology has suffered grievously in the past from an exuberance of imagination on the part of its builders which has led them to create concepts with no corresponding reality as proved by their demolition, by later experimentation. *Hypostasization* is the name the logicians give to this fallacy. The whole *faculty* psychology was erected by assigning a reality, concreteness, and independence to certain concepts of mental life that subsequent investigation shows do not have a corresponding independent existence. Likewise the present *trait* psychology is under the very strongest suspicion of being similarly unfounded. This should put every investigator on his guard against creating psychological fiction by the very names which he assigns to his tests." (pp. 21-2)\*

The emphasis which men like May and Symonds place on the specificity of conduct as a fundamental fact has influenced many investigators to examine their results most cautiously, especially in regard to the matter of variability of responses for each individual over a series of acts, as well as to the variation or range of any group responses in any one situation. That is, a trait may be considered as a variable having a rôle within some one personality, or as a variable distributed over the population at large. It is conceivable that hundreds of such traits may be recognizable in any one person, and yet only a relatively few be possible of isolation when "scaled" over a group. Brown (21) studying suggestibility, Trow (173) studying confidence, and Filter (36) studying self-assurance, found the individual "spread" of response types so large that they each concluded that either there is no such thing as the general trait under consideration, or else that no one test (fitted to a specific situation) could serve as a measure of the trait as a whole. Similarly many other investigators have been careful to hold that their tests are but specific measures of specific reactions in specific situations of social importance, and that to deduce the presence or absence of a general trait such as "honesty," "complacency," "aggressiveness," *etc.*, from reactions to one or two test situations would be wrong.

On the other hand, some psychologists, such as Allport and Vernon (9), Likert (96), Paterson, Elliott, *et al.*, (128), Hull (65), and others feel that it is not beyond the promise of psychology to measure certain larger "phases of personality," qualities which will "hang together" statistically, provided enough good tests and natural situations be used to measure these "innate patterns of behavior," upon which specific reactions are built, such as attitudes or characteristic modes of behavior.

\* From Symonds, P. M. *Diagnosing personality and conduct*. Century Co., 1932.

As one not unfriendly to either position, and perhaps midway between the two, we quote Murphy (122):

"It must be understood that there appears to be no 'all or none' answer to the question as to whether character is general or specific. Rather the question must be stated quantitatively: 'To what *extent* is character general; to what *extent* is it specific?' *Evidence suggests that it is predominantly specific, but to a somewhat smaller degree general.* Character is a function of two variables, of which the more important is the specific situation, but no prediction is meaningful, unless the variable of existing habit organization is also given its place. The problem is a statistical one, and the statistics as far as they go, indicate that in the interaction of the two groups of variables, the variations in the situation contribute more than factors latent in the individuals. But it must be remembered that this has only been shown for a few aspects of personality." (p. 604)\*

### C. SEARCH FOR STATISTICALLY UNIQUE TRAITS

Vernon (175, p. 707), instead of starting with a popular concept, such as honesty, coöperation, and the like, and devising a test calculated to tap the quality, has analyzed some fifty-three sets of standard test scores and found that it was possible to group them into nine separate composites which "hung together," statistically, or which showed a sufficiently high internal consistency to be used as a criterion or standard of some quality or trait. This is not unlike the approaches of Spearman (149) and Kelley (74) who are concerned largely with establishing the unity of abilities. Kelley (74) offers statistical help in identifying such psychologically unique "traits." The best possible analysis of personality is one which will reduce it to "traits" of this larger sort, traits which are "unitary" and distinct from one another. These unique traits in human personality should be discovered, and methods of measuring them be devised later.

As the issue stands at present, among those lined up for "specificity" are May and Hartshorne (59, 105, 106), Witty and Lehman (198), Symonds (157, 158), and others; while among those for "generality" are Allport (5-9), Gilliland (45) and Kelley (74-75), and others. These latter in time will do their part in discovering experimentally "patterns of uniqueness" within the individual. Already suggestive beginnings have been made by Arnheim (11), Wolff (199, 200), Paterson, Elliott, *et al*, (128) and Hull (65).

\* From Murphy, G. and L. B. *Experimental social psychology*. Harpers, 1931.

## IV. METHODS OF STUDYING PERSONALITY

A thorough study of the psychological make-up of a human being is enormously complex and time-consuming; there is no rapid method. In the past many short-cut methods have been offered an eager public, and under various captions: Phrenology, physiognomy, graphology, astrology, palmistry, and the like; but these "systems" of analysis (with the possible exception of experimental graphology) have invariably proved unproductive of satisfactory results, and in no way scientific. Similarly superficial are judgments passed on associates and acquaintances without a real study of the individual. The scientific psychologist differs from the observers above referred to in that he attempts to study the Subject in relation to all the forces which have been playing upon his development—which, in other words, have helped to shape him into the personality that he is today. The psychologist not only considers the total background of the Subject, in so far as it is possible to get the facts, he tries to be as *objective* and thoroughgoing as the natural scientist in interpreting these facts. He differs from the lay observer in that he does not "select" those elements which will fit into a preconceived picture of the Subject; he does not allow his personal feelings to color the issue; it is an intellectual, a rational, and not an emotional analysis which he makes of the data gathered.

## A. THE CLINICAL METHOD

A thorough study of each case requires that the following aspects of the Subject's history be covered:

1. Complete record of his forbears and their collaterals, for at least two generations back; the record to cover health and disease history, social and economic adjustments, educational attainment and other achievement.
2. A record of the Subject's personal developmental history, prenatal and postnatal; with data on health, disease and accidents.
3. Study of the Subject's education.
4. Study of the personalities in his home; its physical aspect and other environmental factors.
5. Study of his spare-time interests, and activities, and companions.
6. Study of his emotional and social make-up and adjustment under conditions of everyday life; his reputation among his associates; teachers, family, friends.



7. Study of his vocational adjustments and achievement.
8. Record of intelligence level.
9. Record of special abilities and disabilities.
10. Outstanding or conspicuous achievement.
11. Study of his wishes, ideals, ambitions, and plans for the future.
12. Study of his repressions, emotional complexes, etc.

To secure these facts, the clinician makes use of certain devices, including the following: The clinical record of family background and early development, usually gathered by the social worker and incorporated in a case history; a medical record and present physical examination, usually obtained from the family physician or the clinic physician; a school report from the teacher, or other scheme of recording educational achievement, such as by the use of standard educational tests; schedules and inventories of leisure time interests, emotional stability, and social economic adaptation—these, often in the form of questionnaires and rating scales; tests of intelligence and special abilities; reports on adjustment, *etc.* from his family and associates; personal interview with the Subject, perhaps frequently repeated, to insure *rapport* and the encouragement of self-revelation.

From all these data, the clinician, especially the psychologist, secures scores, draws up charts and other graphical methods of presentation, and compares his findings with the “norms” or standard scores of behavior established by a known homogeneous group. The psychiatrist, medically trained, is less given to the use of standardized tests and scales, and leans more heavily on personal impressions. As organized at present some clinics are dominated by the medical point of view; whereas, some give considerable weight to the quantitative findings of the psychologist.

Obviously, complete analysis of a personality, if such were possible, requires much time, many materials, tests, measurements, and the like, and a keen insight on the part of the Examiner in interpreting and correlating his findings. Indeed this brings out the chief weakness of the case history—clinical method; *i.e.*, it is too much dependent upon the skill and energy of the Examiner; it may be very extensive, thorough, and concrete (133, 158) or very superficial and impressionistic, and still be called a case-study (130). Obviously, also the experienced practitioner will not find it necessary to investigate all of the twelve “areas” of expression or influence on personality. Certain preliminary approaches will indi-

cate the weaker spots in "adjustment." Certain other factors known to be related to the centers of weakness (or strength) can then be investigated, while others can be ignored. Selection and elimination of procedures constitute part of the work of the clinician, be he psychologist or psychiatrist.

An outstanding objection to the "case study" as a research method is that its results cannot as a rule be expressed quantitatively, and hence do not lend themselves comparatively to data from other studies. Burgess (23) and Young (203) summarize and discuss this method.

## Instruments and Devices of the Clinician

### *i. The Interview*

Before passing on to methods of personality study, other than the clinical, it is in order to consider in more detail a few of the devices employed by the clinician as a means for securing the raw data of his analysis. Of these perhaps the most impressive, and least significant from the standpoint of the psychologist, is the personal interview. During the interview the Examiner asks questions, seeks information and gets explanations, descriptions, often, indeed, rationalizations, and equally insecure opinions. Much of this he discounts at the outset as being inaccurate factually as to the Subject's own experiences, interests, activities, prejudices, and so on; but almost as much can be read "between the lines," as it were, by the shrewd and experienced penetrator of human nature.

In a recent symposium on the interview (120) the general advice to psychologists is to leave nothing to the interview which can be secured by any other method.

### *ii. The Questionnaire*

The questionnaire has been a widely used instrument, especially in the past. It requires a highly coöperative attitude on the part of the person filling it out, whether for himself or for another. It presupposes a truthful and, to a large extent, an "objective" point of view in regard to the subject matter of the questionnaire. That is, the signer must be able to separate his "feeling" from his "thinking" processes and give the cold facts called for, without any emotional coloring. This, for the unscientifically trained mind, is no easy task.

Other errors creep in, such as inability to comprehend the questions asked, or to interpret directions, even when these are stated in very simple terms; sometimes, too, as Thorndike (163) pointed out

long ago, a question acts as a suggestion to an uncritical mind in such a way that it will surely produce an affirmative answer. Some people fail to answer one or more of the questions, and many people fail to answer any at all. This means that those who do send in returns represent a "selected" group—namely, people to whom the subject appeals. Their answers may not represent the population aimed at; and even at best represent opinions rather than fact.

The case of the questionnaire has been summed up as follows, by H. E. Jones and M. C. Jones (70):

"While questionnaire methods have been appraised as belonging to the 'underworld of science,' they still appear to retain some usefulness in opening new areas for investigation. From standpoints which emphasize the un verbalized character of *emotion* [italics ours], questionnaires would be expected to achieve a lower validity in the field of emotion than in other branches of psychological research." (p. 41)

On the other hand, G. B. Watson (184) decides:

"All told, it seems that questionnaires used to obtain information which is objectively available, such as that dealing with the use of time, preferences among activities, etc., may be expected to yield good results, up to the limit set by consciousness of social approval. Questionnaires which ask directly for moral attitudes immediately run afoul of this barrier of convention, and are difficult of interpretation." (p. 296)

### iii. Ratings and Rating Scales

Most of us have, in our school days, received a mark for "deportment." Whether the mark was A, B, C, D or E, depended to some extent on our conduct for the month, and to an even larger extent on the attitude of the teacher toward marks. Some teachers had conscientious scruples against ever giving A's, while others generously showered them over the class. Sometimes, too, the puzzled woman would be in doubt as to the appropriate rating for a given child, and her pen, hovering between B and C, would land on either. This illustrates the difficulty of "rating" character. The ABC method represents our earliest attempts to employ rating as a device.

Since the war days of 1917-1918, ratings have risen and fallen, only to rise again, as devices for evaluating character. (109) Studies on rating techniques and scales have been reported by many investigators. A wide variety of uses has been made of them. From the comparatively simple five-step scale of the Army, later found impracticable by Rugg (141), to the rather elaborate scales of May and Hartshorne's battery (pp. 120-22) great strides towards



"objectivity" and "freedom from prejudice" have been made. Kornhauser (83-95) supplies detailed information on the fallibility of raters.

The first "objective" rating scheme implied comparing the Subject with other people who were so arranged in the rater's mind as to form a scale. The units on the scale were the differences or rather distances between the "scale men." To illustrate: At the top of the scale stood the "best man you ever knew"; at the bottom "the poorest you ever knew"; and in between stood the "average." A five-point scale allowed place for a man who was "a little better than the average" and for one who was "a little poorer than the average" on the trait in question. Rating the Subject involved finding his location on the scale if matched against these five "scale men."

Various other rating schemes, besides the "man-to-man" comparison of the Army have been devised. Among the more common are those which call for a judgment to be placed along a line to indicate the degree or amount of the trait in question which is possessed by, or characterizes the Subject. The use of descriptive phrases for various degrees of the trait (109, 202) help to define its strength more definitely. Traits are found to increase in reliability if the judge indicates the degree to which he has confidence in his own ratings. (157, p. 488)

If the ratings can be freed from prejudice, and if the judges know the Subjects well, and if enough judges are asked to rate each individual and their average judgment is taken, then the ratings should have some value. May and Hartshorne (109, p. 60) are even more hopeful; \* they recently went on record as pronouncedly in favor of well devised rating scales in the study of character.

#### *iv. Tests*

Reference was made to the use in the clinic of standardized psychological tests for evaluating (a) intelligence, (b) educational achievement, and (c) emotional adjustment, interests, and attitudes.

\* Since the C. E. I. scales (devised by May and Hartshorne, and reported here on pp. 120 ff), and since indeed all rating devices are measures of reputation, that is, what people think of a person, rather than of character, what the person really is, their validity can best be established by the agreement of one set of ratings with another. For the C. E. I. rating scales, May and Hartshorne report a repeat reliability of .92. They point out that any reputation score is based on observation of conduct, based partly on general impressions, prejudices, *etc.* If these ratings can be freed from prejudice, as they have largely succeeded in making them, and if the ratings are based on observed conduct, May and Hartshorne think it possible that a high correlation can be obtained between these same ratings and objective tests of conduct, confined to the same area.

The matter of intelligence testing is treated at length in Chapter II; the use of educational tests and scales is straightforward procedure, involving no especial complications; but the problems involved in "personality testing" are illusive, subtle, and highly complex. To get measures of personality make-up the Examiner is compelled to take cognizance of the Subject's behavior, whether in act or in speech. The Subject, once he suspects that his "character is being tested," will tend to give a picture, not of what he actually thinks, feels, and does, but of what he thinks the Examiner will approve in thinking, feeling, and doing—a very different situation from that found in testing intelligence, where the Subject is usually on his mettle to do his best. Or, in other words, he will misrepresent himself in order to obtain a good score. Thus the Examiner is often forced to resort to roundabout techniques of testing, in such a way that the Subject does not suspect the motive of the examination. This lays the Examiner open to the charge of duplicity which, even in the interests of scientific analysis, is not readily forgiven him. Such testing requires the utmost caution to avoid betraying the purpose of the test.

Scientific procedure requires that the test situation should be "controlled," that is, all possible variables should be allowed for, and results should be objective; they should not depend on the personal interpretation of the Examiner. And yet, the more the situation is controlled in a personality test the less it becomes natural, with a corresponding decreased likelihood of evoking a natural or "characteristic" response from the Subject. In this connection the observational studies on small children (discussed on pages 110-114 by Thomas (160), Baker (14), Gesell (48, 49), Blatz (18, 19) and others) are to be commended; and the pencil and paper tests, laboratory procedures, instrumental readings, and the like, to be deplored. Hamilton (53), Bain (12) and Vernon (175). However, a happy combination of paper test and other observations seems at times to be possible. Deutsch (32).

### (1) Validity of Tests of Personality

A serious charge against many of the instruments devised to test some aspect of personality is that the assumption underlying the test is, itself, not valid. (This was discussed on pages 97-102.) A label is put on a test as being one, for example, of "aggressiveness," "self-confidence," "conscientiousness," "thrift," *etc.* The test is launched on the market, purporting to be a measure of the particular trait in question. In the effort to prove that a test measures

what it claims to measure in its title, authors try to investigate its efficacy in picking out individuals who have that particular trait in varying degrees. But who is to judge the relative strength or degree of the presence of the trait in each individual, on whom the new instrument is to be tried out? Obviously, some person well acquainted with the Subject. But it is almost impossible for even the most reliable judge to know a large number of Subjects equally well. This snag, namely, the fallibility of the ratings of the judges, was discussed on page 106. If the criteria are weak, what can be expected of the test which has been validated against unsound ratings?

Sometimes the judge's opinion may be poor, sometimes the individual may not reveal himself as he is, and traits which he possesses may go unrecognized, or may be clouded over by compensating factors, such as good social presence, high intelligence, and so on, which dazzle the observer to the point of befogging the presence of the trait sought.

Another method than that of validation by ratings is to match one test against another. This is to assume the efficiency of the standard against which the new test is to be checked. The personality testing movement is, to date, not sufficiently advanced to claim that any test within its scope is infallible as such a standard. There are still other methods; such as by differentiating of homogeneous groups: Lentz (95), Watson (178), by sampling: Voelker (177), and May and Hartshorne (55-59), by history records, clinical case studies and diagnoses: Hendrick (61), by age: Otis (126), *etc.*, but each method offers difficulties peculiar to itself.

## (2) Validation by Sampling

The "sampling technique" is different from the attempt to measure a trait as though it were a basic faculty of personality. The method of trying to find a specific test for a specific trait is giving away to, not a test for one trait, but a battery containing many sub-tests, each measuring different aspects of some trait, with no assumptions on the part of the tester that he is measuring any unitary function.\* For instance, when May and Hartshorne studied

\* May and Hartshorne (59) point out that "response to one situation is not a reliable measure of a complex trait. . . . Many situations must be used and many responses given . . . the greater the number of items, the more reliable is the test." Roback (139) adds that "variety of items is even more important than their number, and, furthermore, a sharp line must be drawn between verbal tests questionnaires such as Pressey X-O tests, the various ethical judgment tests and the personal data sheets, and the conduct tests. For the measuring of intelligence, a verbal test is quite in place, but in the realm of personality testing, it affords but an indirect clue." (p. 368)



deceit and found that some children cheated in school, others at home, others at parties, others at athletic contests, and that cheaters on one occasion were not necessarily cheaters on any or all occasions, the investigators considered calling the various situational reactions not "cheating," but "Behavior A," "Behavior B," *etc.* Eventually the behavior to be measured—namely, cheating—was the average of results on a large number of cheating tests.

May and Hartshorne have validated their tests largely by this "method of sampling," that is, by testing a good many samples of behavior in question. Each test is then correlated with the sum of the others in its battery, since the battery is the nearest they could get to "the perfect standard of the infinite number." (59)

### (3) Reliability of Tests of Personality

In regard to the reliability of personality tests or their "constancy value," or, as May and Hartshorne (107) define it, "the similarity of responses made on different occasions," it may be said that very few tests have been examined with this in mind. However, beginnings have been made.\*

#### B. DIRECT OBSERVATION; SAMPLING OF UNCONTROLLED BEHAVIOR

This method, which is rapidly gaining a foothold, especially in preschool groups, interested in studying the social development of children, involves a natural play situation for the toddlers and one or more observers, usually screened (as in the Yale, Toronto, and T. C. Institute of Child Welfare groups) in such a way that they can clearly watch the spontaneous activities of the child, but yet remain unseen by him. Reviews and accounts of this procedure can be obtained in the articles by H. E. and M. C. Jones (70), Shuttleworth (147), and the Proceedings of the First International Congress of Mental Hygiene (134). D. S. Thomas, *et al* (160) who refer to their method as "experimental sociology" have studied such factors as talkativeness, laughter, social resistance. Ball (13) reports on emotional stability; other accounts of this "controlled observation method" are to be found in Bühler (22); Goodenough (51) reports on "repeated short samples, and Rugg, Krueger and

\* The Downey Will-Temperament, the Woodworth Personal Data Sheet, the Pressey Cross-Out, and certain of the introversion-extroversion series have been studied by many investigators, while the battery produced by the Character Education Inquiry has been subjected to the most detailed statistical analysis. Interrelations of one test with another and with batteries as a whole, as well as with repeated administrations of the same test after a short time interval, are reported.

Sondergaard (143) studied language development by their "eye witness analyst" technique.

As Thomas points out (160) an adequate understanding of personality, especially of the preschool child, cannot be obtained from data in a "controlled" situation, but requires essentially the multiple stimuli of the social situation as found, for instance, in the preschool laboratory. Here the overt behavior of a given child, unimpeded by experimental restrictions and stimulated by the presence of other children and play objects, is allowed free rein, and a knowledge of his emotional social relations is afforded. The difficulty of recording these observations in quantitative form has engaged the attention of the "experimental sociologists" who feel that it is much more important to control the observer than the observed. The gain achieved in obtaining relatively un-selfconscious social behavior on the part of the children has driven these workers to develop new techniques for defining social units of behavior in objective and limited terms. Illustrative of their procedure is the work of Barker (14) who requires the observer to:

"... chart on a floor plan drawn to scale the movements of a child during a five minute interval. Simultaneous records of two observers working independently were made to study reliability. Three methods were used for testing reliability. The agreement of observers was measured first by the Pearson correlation coefficient. The significance of the difference between means was found next, and third, where there were enough records on individual children, the rank order of the children according to the means of the two observers was compared by the rank system of correlation." (p. 66)

Barker found high agreement on such activities as distance covered, time of activities, and less for material activities, social contacts, self activities, *etc.* She recommends that two observers be employed to record simultaneously, the one on "responses to people," the other on "responses to material objects."

Barker's activity code and a sample record of a floor plan are reproduced on pages 112 and 113.

Goodenough (51), also recognizing the difficulty of devising a series of situations which would produce a natural (*i.e.* habitual) mode of response to other persons, to emotional stress, or to the ethics of everyday life, recommends a slight variation of the "short sample" observations method which does away with the weakness of the rating scale and the paper test. Her plan requires the regular observation of an individual or group of individuals for a definite specified period of time every day for a number of days, and

FIG. 17. EXPLANATION OF ACTIVITY CODE.

ACTIVITY CODE

Lead pencil line always for a given child's activity


Red crayon line for other person's activity


Lines indicate progress of child

Solid, when spontaneous 

Broken, when directed 

Cross indicates end of activity

Solid, when spontaneous 

Broken, when directed 

Capitals indicate beginning and end of activity

A   B  CD

explained by marginal notes

AB pulling wagon

CD jumping

Temporary distractions indicated by exponents

A   A<sup>1</sup>B<sup>1</sup>   A<sup>2</sup>B<sup>2</sup>   B

AB pushing doll carriage

A<sup>1</sup>B<sup>1</sup> hits Paul

A<sup>2</sup>B<sup>2</sup> smiles at teacher

Circles and triangles indicate other persons,



children by given number, teacher by T


Triangles, if person is involved in child's activity

when record begins  

Circles, if person approaches child

spontaneously  

at child's direction  

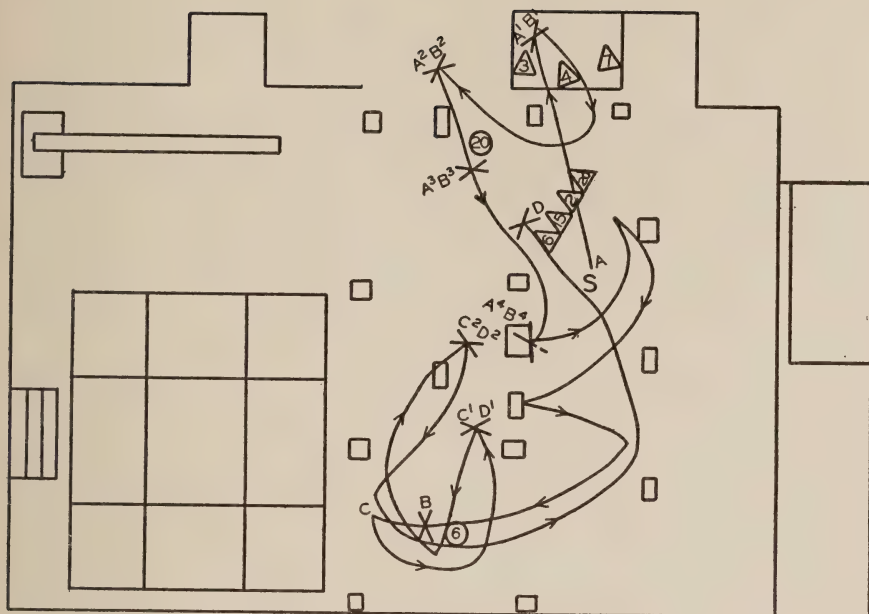
if child approaches another person 

if person approached leaves child  

S indicates start of five-minute record

F indicates finish of five-minute record





EDWARD—I2/6/28—DST

AB—Piling blocks. Making train with them .....	84"	A'B¹—Puts blocks in swing and swings them .....	50"
A¹B¹—Embraces Peter .....	50"	CD—Rolling barrel—piles blocks up .....	97"
A²B²—Looks at Lid .....	4"	C¹D¹—Pushes blocks out of swing. —	
A³B³—Embraces Joan .....	2"	C²D²—Pushes blocks out of swing. —	

FIG. 17. DIAGRAMMATIC REPRESENTATION OF ACTIVITY CODE.

From M. B. Barker. *A Technique for Studying the Social Material Activities of Young Children*. Courtesy of Teach. Coll. Bureau Publications.

the objective recording of the appearance of certain specified forms of behavior during these observation periods. The number of periods showing positive record is then treated as a score. Of course, all individuals to be compared should be observed under similar conditions, as in the ordinary classroom, playground, or free play hour in the kindergarten. This is not unlike the method devised by Olson (125) on the expression of certain nervous overt reactions, thumb sucking, nail biting, *etc.*

The advantages which Goodenough claims for this procedure are that it is direct, quantitative; requires no greater total time than more usual procedures (although the distribution of time is different); can be applied to widely different kinds of traits, many of them otherwise difficult of measurement; and it interferes little or not at all with regular activities of the children. She warns against making generalizations from one situation to another, situations which may seem to be the same but yet be different.

Goodenough has used this method of "repeated short samples" to report on such traits as: Physical activity, laughter, conversation, social participation, leadership, anger, dramatic play, and eating habits (self-help, response to food, *etc.*). Eight pairs of observers each made an average of ten observations per child. Reliabilities for the eleven traits ranged from .324 for laughter to .871 for dramatic play; hence it would appear to be a method of great promise and merit.

#### C. GENETIC APPROACH

The genetic approach to the study of character is concerned usually with the gradual development from simple reaction patterns to highly intricate "learned" behavior or, to speak behavioristically, through "conditioned reflex" growth. Chief among workers on maturation are Gesell and Thompson (49) and Shirley (146). Some studies, such as that of Andrus (10) and Taylor (159), report inventories of child activities at different age levels, three, six, *etc.* Intensive studies of mental and motor abilities in infants and young children are being constantly pursued at the various centers for pre-school children, listed on page 145 at the end of this chapter.

#### D. SOCIOLOGICAL APPROACH

Sociological approaches, of which Thrasher (165) and Shaw's (144) work are outstanding examples, are concerned, on the whole, with factors which affect the formation of personality, such as the home, the street, parental attitudes, companions, and the like. But

here the focus of attention becomes shifted from personality itself to its cultural setting, a topic which will be discussed in Chapter V. "Measurement of Personality" to these workers would imply of necessity, measurement of environmental factors.

#### E. PSYCHIATRIC APPROACH

A world-wide review of the psychiatrist's point of view is to be found in the Proceedings of the First International Congress on Mental Hygiene (134). See also pp 440 ff) Endocrinology is reviewed by Lipschütz (97), while Bogen (20) discusses the work done on "types," especially in Germany. The "type" theory as a basis of classification of human beings has found rather less support and sympathy in America. May (106) condemns it because the concept of dichotomous types "violates the statistical normal curve"; while Allport and Vernon (9) explain its age-old popularity in terms of scientific laziness. However, sponsored by E. R. and W. Jaensch, research on "eidetic types" has been pushed forward since the first discovery in 1907 that some individuals, notably pre-adolescent children, had "eidetic images," *i.e.*, were able to "see" more or less clearly the image of objects already removed. Later identification of the eidetic individuals with the "Basedow" or B type, and "tetany" or T type of personality on the basis of their characteristic E. I.'s, is on less secure ground. The theory of type basis of personality will be discussed in Chapter V. Here we shall sum up the general position of the "typological psychologist" in Klüver's (80) analysis which claims the existence of types because of the existence of certain "fundamental characteristics" of the personality. To fit the personality to the formula, one must, in Klüver's (80) words:

"... appreciate the central position the concept of type has in the work of Jung, Rorschach, E. R. and W. Jaensch, Kretschmer, Spranger, and others. It is claimed that personality types exist since in psychology we must admit, *e.g.*, the existence of two different modes of adaptation to the world (Jung); two "psychological vegetative systems," the first of which appears to be chiefly dependent on the cortex, the second one on the sub-cortex (W. Jaensch); differences in the attitudes of individuals to the manifestations of cultural life, such as 'science,' 'art,' *etc.* (Spranger); differences in constitutional organization expressing themselves in body build and character (Kretschmer); dominant dispositions of a psychic or psychophysically neutral kind (W. Stern), *etc.* By speaking of 'types,' then these investigators point to such phenomena as 'interaction' of psychological functions constituting a special mode of adaptation to the world'; 'psychophysical vegetative system'; 'the fundamental psychological



function'; 'dominance of one value'; 'dominance of a psychic or a psychophysically neutral disposition'; *etc.*" (p. 784) \*

## V. CLASSIFICATION OF PERSONALITY TESTS

### A. DISCUSSION OF CLASSIFICATION

The rest of this chapter will concern itself chiefly with the *test method* of studying personality, and will content itself with reviewing very briefly some of the better known tests. Tests of personality can be considered under the following groupings: †

1. Batteries: Including several tests, intended to measure one or more aspects of personality.

2. Attempts to measure personality "traits" and types of behavior, usually revealed in *conduct* reactions, *e.g.*, deception, incorrigibility, perseverance, *etc.*

3. Attempts to measure "inner sets," not so readily revealed in conduct: These are usually measured by pencil and paper tests, and require the Subject's coöperation in recording his likes and dislikes; also by disguised techniques, wherein the Subject does not suspect the purpose of the test. General social, religious, racial and other attitudes, have been measured; also such specific attitudes as open-mindedness, intellectual, social and reading interests, *etc.*

4. Attempts to measure emotions, temperamental trend, *etc.*

5. Attempts to measure one's "character"—usually conformity to convention. These are, as a rule, pencil and paper tests which require the coöperation of the Subject in ranking or rating situations, acts, ideas, values, principles, *etc.*

6. Miscellaneous: Techniques and systematic outlines and guides for observing personality reactions.

The difficulty of drawing a line between one division and another need hardly be stated. The decision as to where a certain test should be grouped is often arbitrary. An attitude such as "caution" expresses itself in terms of an emotion and becomes "fear"; or in terms of thought, where it may become "shrewdness of judgment." Obviously, the boundary lines cannot be definitely drawn either for traits, or tests.

\* From Klüver, H. Do personality types exist? *Amer. J. Psychiat.*, 1931, 10.

† In 1925, May and Hartshorne drew up a list of tests claiming to measure some aspect of character or personality (107). Each year since then the list has been supplemented by current offerings. The tests are classified by what they claim to measure, while at the same time, the reader is cautioned that the validity of this claim can be proved only by elaborate statistical procedures (110-14, 191).

## B. ILLUSTRATIONS OF TEST MATERIAL

*i. Sampling of Conduct*

One of the earliest "character" tests on record (not included in the May-Hartshorne inventories) may be credited to the physician Galen in the second century A. D. Galen, charged by the Emperor to find out if the Empress was in love with a certain courtier, caused the suspected lover to walk through the room in the presence of the Empress, while the physician, with true experimental zeal, felt the lady's pulse, on the alert for a more rapid beat! It is not such a long step between the Roman doctor's crude scientific observation and our modern attempts to record physiological changes in blood pressure, heart-beat, electrical resistance of the skin, *etc.*, during emotional tension. A second feature of Galen's experiment, still emphasized, is the need to make the test situation conform as much as possible to the real life situation. This type of test bears the more technical term of "sampling" and is reflected in our best character tests of today, those which are of the performance type. In these, a situation is set up in a way that requires the Subject to act so that his behavior will reveal certain aspects of his character with regard to that specific situation. Answers are supplied which could not be reliably obtained through word of mouth.

If enough situations (statistically ascertained) are set up, each of which does its bit to indicate the expression of a certain trait, *e.g.*, trustworthiness, then the psychologist feels that he has secured an index to that Subject's character with respect to that characteristic. This, of course, is a long drawn out and laborious piece of work, and will be exemplified later in the reports of Hartshorne and May.

The first official character tests to be offered to the psychological profession were the "Ethical Discrimination Tests" (35) which, as their title indicates, were tests of knowledge and ability to discriminate between right and wrong rather than between ways of behaving. Many experimenters since Fernald's publication of these tests have tried to bridge the gap between what a person thinks or says he would do under certain conditions and what he actually will do.

In 1921 Voelker (177), trying to evaluate the efficacy of scout training, evolved two batteries of conduct tests which presented situations that were "true to life" and which showed promise of measuring the traits in which Voelker was interested, such as hon-

esty, trustworthiness, and other ideals of the scouts. To the question, "Will the boy cheat on a test?," Voelker, by means of a waxed paper, inserted between the leaves of a test booklet, was able to ascertain whether or not the boy had cheated when offered the temptation and opportunity to do so. To the question, "Will the boy accept a tip?," Voelker arranged to have a third person offer such a tip and record the boy's response. Similarly to other questions situations were arranged, and, unknown to the Subject, reactions were observed and checked.

## ii. Character Education Inquiry

Although Voelker did not standardize his tests for wider use, his contribution by way of methodology gave impetus to much valuable work later on, notably the tests evolved by the Character Education Inquiry, under the able direction of May and Hartshorne who spent five years experimenting and developing tests, mostly on the conduct side.\*

Proceeding on the theory that "the only sense in which conduct can be measured is by taking samples of it," in much the same way that a grain inspector digs under a carload of grain to obtain samples by which to assay the whole (59, p. 612) these investigators attempted to measure the honesty of children by sampling their tendencies to cheat, steal, and lie. To measure cheating they secured fourteen samples from situations in the classroom, four in athletic contests, three at parties or parlor games, and two of school work to be done at home. Examples of cheating behavior included such responses as the following: Copying answers from a key which was supplied for the purpose of self scoring; adding sums after time

\*In explanation of their line of attack on the problem of character measurement, May and Hartshorne state (59):

"... Our general theory of character requires that we measure a child's total character by a process of sampling. . . . We may think of a child's total system of conduct as a house of many rooms, each room containing his responses to one type of situation. To know the contents of one room thoroughly requires the sampling of performance in that room only. Enough samples must be taken to enable us to predict the entire contents of the room. That is, the tests used should correlate not less than .95 with all possible tests of this sort of behavior. We have approximated this figure with our several measures as follows: Honesty .93; service .75; persistence .78; inhibition .78; and moral knowledge .93.

"But from the sampling of a single room we learn little of the other rooms. . . . We can gain a fairly good impression of the character of the whole house if we take a small sample from each of several rooms, recognizing that we may be in error on certain points. . . . (p. 363)

"A selection of nine measures . . . yields an inter- $r$  of .405. This implies a theoretical validity of .93. . . . Thus with this sampling of nine rooms, we may say that the whole is about seventy per cent represented." (p. 364)

From Hartshorne, *et al.* *Studies in the organization of character*. Macmillan, 1930.



was up; opening eyes in stunt activities when the rules required that the eyes be closed; breaking rules to solve puzzles, win races, and achieve along various lines in which cheating could be detected by the observer.

"Service" was interpreted to include such types of behavior as helpfulness, coöperation, self-denial, self-sacrifice, charity, and the like. Here the Examiners attempted to set up situations "with an appeal and at the same time a resistance." The self-denial tendency was tested in such situations as asking children in an orphans' home to give up ice cream and allow the money to go to a Russian orphanage (remote appeal); or inviting school children to come to school a half hour earlier than the regular time to prepare scrap-books, *etc.*, for hospital children; or to present children with an attractive box of school tools, pens, pencils, mechanical pencils, erasers, *etc.*, telling them that they might give what they cared to, to the less fortunate. Scores were given, based on credits assigned to each object, in proportion to its apparent attractiveness as indicated by the children's responses.

"Coöperation." Four measures were obtained by giving children the opportunity to work for credit for themselves individually or to do teamwork for their class in competition with other classes. The score was based on the differential in the amount done for self or for class.

"Inhibition" prompted those investigators "to set up a situation in which the child would be stimulated in a natural way and then introduce a more or less artificial resistance, the object being to find whether or not the child could inhibit the tendency toward the natural response." To measure this quality both individual and group tests were presented.

The individual tests were introduced as games and involved largely sensory control. For instance, the child would be asked to see how long he could keep "a poker face" or act like "a wooden Indian," when put under the strain to laugh, jump, or "pull a face." Bitter substances, such as unrefined cod liver oil and argyrol were placed on his tongue; unpleasant odors, such as asafoetida, were held under his nose and he was encouraged to take three whiffs; his neck would be tickled with a feather, or he would be shown funny pictures and told not to laugh.

Group tests of inhibition were quite ingenious. On each child's desk was placed a toy safe with the dial set, and children instructed not to tamper with it until the game was called for. In the meantime, "filler" tests were given and time was otherwise

wasted, in which children could yield to the temptation to play with the safe. Observers went up and down the aisles noting changes in reading on the various dials.

"Persistence" was measured largely by the length of time a child would stick to an assigned task, such as solving "magic squares"; unusually difficult mechanical puzzles; or continue to read stories printed in a confusing manner, with letters run together (later with capitals and small letters indiscriminately mixed), and words wrongly separated. The degree of difficulty to be overcome could also be determined, as well as the length of time during which the child persisted.

"Moral Knowledge" was measured by a series of tests which attempted to get at attitudes, preferences, opinions, and information as to what the children considered right and wrong. The children would be asked to indicate the probable consequences of many acts, to indicate their choice as to various types of social activities, how they would behave under certain circumstances, *etc.* Tests of the "knowledge" type are not always clearly separated from intelligence testing, and under certain circumstances might even be substituted.

"Reputation" scores were secured by means of refined rating devices. The teachers, the parents, and others were asked to use these devices and indicate the position of each child on the scale. A sample item is given by way of illustration (109):

1. Conduct Rating Scale:

- a. Works with others if asked to do so.
- b. Works better alone, cannot get along well with others.
- c. Works well and gladly with others.
- d. Indifferent as to whether or not he works with others.
- e. Usually antagonistic or obstructive to joint efforts.

The rater, who judges, does not know the values of the various steps on the scale and is therefore not influenced to be lenient or prejudiced. Yepsen (202) who first devised this type of scale reports a reliability of .77 on a complete survey.

"The Guess-Who" test consisted of a series of twenty-six very brief character sketches, and was an attempt to get the pupils' opinions of one another. The children took it as a guessing test and did not sign their names. The score was the number of positive sketches minus the number of negative sketches which each child had credited to him by all the children. Three sample sketches follow (109):

4. This is a jolly good fellow, friends with everyone, no matter who they are.
5. This one is always picking on others and annoying them.
6. Here is a crabber and knocker. Nothing is right. Always kicking and complaining.

The reliability of this test lies between .90 and .95, which is very high for a rating scale. Its authors feel that if the items were scaled, this scoring might be refined. (109)

In addition to these two measures of reputation, a third measure is recommended by its authors, namely, a list of eighty pairs of words, which observers are to check to record their opinions about the children. In general the words on one list are the opposite of the words on the other list, and are given at separate sittings.

These three devices to secure opinions of teachers, classmates, parents, and others about the children, together with three other devices, showed a remarkable correlation with the composite of the objective tests, so much so that Hartshorne and May (60) write:

"An interesting practical implication of all this for character testing is that since it is probably easier to secure a series of valid judgments concerning attitudes and conduct tendencies than it is to secure an equally valid series of objective tests and since the theoretical correlation between the two is almost perfect, teachers and others interested in securing a character score on children might very well look forward to doing so by securing a large number of reliable observations and ratings, provided the instruments used are of such a nature that prejudice and gossip are eliminated." (p. 617)

In addition to those tests rather briefly suggested above, the Character Education Inquiry used certain supplementary measures, as part of their "battery." Since this scale did not represent an ascending or descending degree of character, the matter of a final score could not be reduced to an average of all scores. Instead, they determined each Subject's "consistency score," which was his variability from his own mean on all tests taken. Of two individuals having the same average score, one might be up on one test and down on the other, while the second might be less erratic or more consistent. From this they deduced a "character score" which was consistency times level. (59-60) It is through such an approach that one's "integration" of character can be indicated. Watson (184) has commented pertinently on their concept of integration. May and Hartshorne (59) sum up their contribution to the problem of character measurement, thus:



"There is no test which does not appear to have relation to at least one criterion of character. Some are more closely bound up with character than others, and these in combination may be thought of as a total character test. Whether we think of character as best represented by reputation, or by the combined judgment of a large number of educators, or by the ability of children to function well in the life situations to which they are exposed, or by the degree of integration they have achieved, the tests which we have brought together may be used as representative of the criterion. And to the extent that each makes a contribution to the total, it may be called a 'character test.'" (p. 363)

The battery recommended by these most authoritative investigators of character, covers the various types of procedures recorded on page 116. Conduct tendencies are measured by "sampling" tests, of the sort described in our preceding pages; emotional make-up by the Woodworth-Mathews Personal Data Sheet; attitudes, opinions, conformity to moral and conventional standards, *etc.*, by tests, also described; and reputation, or what other people think of the Subject, is secured by means of "functioning blanks" and various rating scale devices.

### *iii. Reactions in Writing*

To acquaint the reader with instruments other than those used by the Character Education Inquiry, which are largely concerned with the measurement of moral behavior, certain other tests will now be considered.

Of perhaps the most interest in the field of "honesty" rating is the contribution of Henning (62), a German psychologist reported by Maller (99). Henning's (1) "Partnership Tests" involve the performance of certain laboratory tasks, employing a double ergograph and a punching machine for which separate records are made for each of the two partners, and without their knowledge. His (2) "Initiative Tests" also require two Subjects, working together in such a way that the work of one interferes with the work of the other. In this situation separate records are made of dominance and initiative of both persons and without their knowledge. Reactions are required to a differential tachistoscope, a double scissors, and a bow knot test. (3) "Caution" test requires them to stretch an elastic band and bend a glass rod "near to breaking point," which breaking point is of course an unknown quantity. Amount of bending and stretching is recorded. (4) The "Honesty" test calls for card sorting into compartments; self records of amount sorted are kept. On the corners of each card are small metal plates which make an electric

contact and automatic recording device. The discrepancies in the accounts of the Subject and the automatic record afford a check. (5) A fifth test is "Self-description," requiring the use of fifty cards, on each of which are little phrases: "I am vain," *etc.* The Subject is required to sort these into three piles in regard to whether he thinks the traits apply to him or not; a "Yes," "No," and "Uncertain" grouping, which also is automatically recorded.

#### Mind-set, Including Attitudes, Opinions, Prejudices, Interest

"Most attempts to study attitudes have been by way of getting verbal responses through questionnaires, rating of verbal symbols in gradations of liking—disliking, and asking people for preferences, desires or interests. . . . The assumption seems to be that people really do, or will do, what they say they have done, or will do. The psychoanalytic school has shown the falsity of this assumption." (12, p. 360)

Bain goes on to stress that there is even greater discrepancy between verbal "attitude" and actual behavior, if these studies are on tabooed subjects, as many of them are. Much time and labor is wasted unless scientific determination is made of the correlation between the verbal and the actual. This relationship should in every study be discovered "before resulting generalizations are to have predictive value."

Attempts to measure interests, attitudes, prejudices, etc., range from very simple checking lists to elaborately constructed scales. For a summary of the work done in this field the reader is referred to Bain (12), Murphy (122), Vetter (176), Katz and Allport (72), Watson (191).

The problem of the detection and measurement of attitude has already been touched upon in our discussion of the generality or specificity of "traits" (pp. 97-102) and has been ably presented by Likert (96) who calls attention to the two definitions of attitude commonly adhered to by psychologists: That attitude is (1) a "tendency to" or "verbal substitute for" overt behavior, and (2) a "tendency toward a particular response in a particular situation." On either basis the number of attitudes possible to any one individual would be infinite (and absurd), whether attitude means "assent or dissent from a particular verbal proposition," or the "number of definable attitudes existing in a given person at a given time." This would depend upon the range of stimuli to which he is subjected. Likert (96) sums up the controversy as follows:

"It is clear then that those who have defined attitudes in the above two ways have not meant exactly what they have said. They have

really intended to indicate not the actually discriminable tendencies to overt action or the verbal response patterns, but certain discernible *groups* of social responses. Within each group a family resemblance of the various responses is assumed, and each group of attitudes is supposed to show some distinguishable difference from every other group. If the analysis is pressed far enough, this turns out to mean that the attitude is a habit sufficiently compact and stable to be treated as a unit. It will, of course, be recognized that variations of an individual's response within this sphere of a given 'attitude,' together with differences between each attitude and the next, are involved. If it is my 'attitude' to regard the eating of starches as a dietetic monstrosity, either an inherited dislike for such foods or a bundle of acquired tendencies directed towards bread, potatoes, rice, etc., must be assumed to exist. Whether we take the attitude therefore as an entity innate or learned, it is in either case not an inflexible and rigid element in personality, (if, in fact, any such elements exist), but rather a certain *range within which responses move.*" (p. 7, 8) \*

If attitudes are measurable, then it should be possible on the above basis to separate them one from the other; if impossible of measurement then there is simply an "infinite series of attitudes, and measurements would mean determination of the amount present, but of what tendency, one could never know."

Likert, proceeding on the basis that verbal substitutes for overt action would indicate inner dispositions was able to detect five major attitude areas within the field investigated, *i.e.*, attitudes toward international relations, race relations, economic conflicts; and, to a lesser extent, political conflict and religion. His results indicated clear-cut group factors and his relatively simple method of obtaining units of measurement by sigma scoring techniques, he believes, is as effective as Thurstone's (166-169) more elaborate statistical processes. His work, well worthy the detailed attention of all students of mental inheritance, cannot be discussed here at greater length. To what extent any basic attitudes in personality are contingent upon cultural influences, and to what extent they represent general underlying biological dispositions of temperament is a problem in research which can be tackled only *after* certain "general factors" have been offered by statistical research with a reasonable degree of confidence. Perhaps the foremost worker in the field of attitude measurement is Thurstone. His work should be consulted. Here we shall content ourselves with merely presenting one or two instruments of measurement, devised by different investigators of human attitudes.

\* From Likert, R. A technique for the measurement of attitudes. *Arch. Psychol.*, 1932, 140.



## Vetter's Tests of Social and Political Attitudes

Vetter (176) who sums up the work on social and political attitudes, favors the method of registering opinions on a varying scale, in order to get more than a yes and no classification of opinion. An example will be given below from the test which he reports in full in the same article on opinions over such things as government ownership, confiscation of wealth, subway fare, social limitation in mating, birth control, and other controversial issues.

Vetter finds it possible to secure five types of answers: Reactionary, conservative, neutral, liberal, radical. The subject encircles the number which best represents his sympathies.

Examples:

No. 7. The question of Birth Control:

- (Con) 1. Physicians should be permitted to supply information and materials for birth control only in the cases of married women whose lives would be in actual jeopardy by pregnancy. Other spreading of information and materials to be strictly forbidden.
- (Con) 2. The general dissemination of information and materials for birth control should be forbidden but it should be made available to families of paupers and defectives.
- (Lib) 3. The government should adopt an attitude of complete *laissez-faire* and remove all present restrictions or laws in regard to contraceptive information.
- (Lib) 4. The government should see to it that all married persons are supplied with information and material for birth control as part of the process of legal marriage.
- (Rad) 5. Government educational machinery should supply both information and materials for birth control to all persons of both sexes, married or single.\*

Of course, the positions indicated by numbers in parentheses at the left do not appear on the blanks submitted to the Subject.

## Watson's Tests of Public Opinion

A "hidden" attempt to test attitude is represented in G. B. Watson's "Tests of Public Opinion" which are not really tests of public opinion but of fairmindedness. (178-79) In Form A the Subject is asked to cross out from a list of fifty-one words those which suggest unpleasantness, *e.g.*, Bolshevist, Sunday Blue Laws;

\* From Vetter, G. B. The measurement of social and political attitudes and the related personality factors. *J. Abn. & Soc. Psychol.*, 1930, 25.

in Form B he is given an opportunity to check on a five point scale his attitude on a highly controversial issue, *e.g.*, "Prohibition in the experience of the United States has been a failure." In Form C a fact is stated, followed by six conclusions; the Subject is asked to check only those inferences which are certain. In Form D the tests consist of fifteen statements of reactions with an opportunity to approve or disapprove, or be indifferent to each act. Form F contains a number of generalizations about Jews, ministers, I. W. W.'s, business men, *etc.* The Subject states whether these remarks are true of "all, most, many, few, or no" members of each group.

The tests are scored in such a way that tolerance or prejudice is registered on each test regardless of "sides" or issue. They embody a principle rather cleverly hidden which tests a given attitude toward social questions.

In developing the tests twelve lines of bias were studied by Watson, including the points of view which would be in agreement with economic radicals, economic liberals, economic capitalists, modernists and fundamentalists in religion, Protestants and Catholics, persons with strict or loose standards of sex ethics or similar moral questions, and religious radicals. The reliability of these tests is low, and their validity has not been well established. The tests were rather extensively employed soon after publication, but more recently have been dropped, even by Watson himself. A vast array of new tests of public opinion have appeared since the Watson tests were presented, among which might be mentioned those by Harper (54), Sweet (156), Thurstone and Chave (169), Neuman, Kulp, and Davidson (123).

A far less pretentious device for measuring certain dispositional factors in pupils at school may be illustrated by the New York Rating Scale for School Habits, of which a sample profile is here submitted. This scale (29) was devised by Cornell, Coxe and Orleans. It is essentially a rating scale and not a quantitative measuring instrument; the rating is made by an observer other than the Subject.

### Interests

Whereas attitudes are a more or less verbalization of inner feelings and points of view, the term "interest" is usually reserved to cover activities, social, intellectual, material, *etc.*, actually pursued by the individual. The most usual and least valuable method of as-saying interests is to ask the Subject what he is interested in (155). A closely related plan as used by Garretson (47) is to ask the Subject to indicate his likes and dislikes, the objective here be-

Example

Neatness

Exceedingly careless in written work	Written work fair in general appearance	Unusually painstaking in general appearance and details of written work
--------------------------------------	---	---

Initiative

Makes no contribution to class work even when urged	Occasionally makes contribution to class work and is pleased when he does, but is usually satisfied to follow	Always attempts to contribute to class work
---	---	---

Ambition

No desire to continue his education	Willing to continue his education under favorable circumstances	Exceedingly eager to continue his education even in the face of difficulties
-------------------------------------	---	--

Stability

Extreme unevenness in daily achievement	No marked unevenness in daily achievement	Same quality and quantity of work from day to day
---	---	---

FIG. 18. PARTIAL PROFILE ON SCHOOL HABITS. From Cornell, Coxe, Orleans, New York Rating Scale for School Habits. Copyright, 1927, by World Book Co., Publishers, Yonkers-on-Hudson, New York.

ing less obvious to the Subject. Another method is to secure a record of what the individual actually does over a given period of time, as projected by Lehman and Witty (92-94). Still another procedure is to give an information test of the kind reported by McHale (119), the assumption being that knowledge within given areas of activity will coincide with interest in those fields. Perhaps the best technique of all is to observe the individual behavior in specific situations. This plan has been followed in the study of pre-school children as reported by Hulson (66), Gesell (48, 49) and others.



The following instrument is of the "inventory" type, and is given here to illustrate an interest test. It is selected largely because Terman found it useful in his genetic studies of genius (25).

### The Lehman Play Quiz

Acting on the assumption that personality is reflected through various forms of behavior, and that one type of paramount importance in a child's adjustment is his play, Lehman and Witty (92) carried on extensive investigations into the play life of 6886 children, ages ranging from five to twenty-two. They regard play "as those behaviour manifestations which individuals exhibit 'just because they want to.' " They attempted to find out what are the play activities the children like best, what activities and games consumed their greatest amount of time, the extent of participation of any child with other children, and the effect upon play of such variables as age, sex, race, season, intelligence, community and the like. They drew up a "comprehensive and catholic list" of 200 play activities, known as the "Lehman Play Quiz." On this quiz the child indicates his answer to their inquiries by checking, encircling, and so on. Illustrative items are as follows:

- |                            |  |
|----------------------------|--|
| 1 football                 | 120 bowling  |
| 20 sliding on a toboggan   | 140 playing house  |
| 40 gathering flowers       | 160 tin-tin  |
| 60 playing piano (for fun) | 180 using a hammer, saw, nails, <i>etc.</i> ,<br>for fun |
| 80 doing stunts in gym.    | 200 playing with (animal) pets                           |
| 100 blind man's bluff      |  |

### Instincts and Emotions

Cattell (138) refers to emotions as being "such a large part of our life and yet such a small part of our science." This comment rather adequately sums up the status of measurement in the field of emotions. The relatively small progress which the psychologist has made in the detection and measurement of emotionality in man is not at all in proportion to his attempts to do so. His efforts have in general proceeded along two lines: (a) Detecting the presence of any particular emotion, such as anger, fear, and so on; and (b) measuring the extent or spread of man's general emotionality in his all-round make-up. It is a matter of common observation that some people react more quickly than others, more violently, and more surely, to stimuli which set up states of emotional excitement, whether these be anger, jealousy, grief, love, fear or any of the fundamental emotions. With the emotional integration of the individual the psychiatrist is particularly concerned, but he makes his studies

subjectively and largely through results of personal interview and case reports. But the psychologist has felt his obligation to select and arrange individuals according to strength and spread of emotions, *by test*.

#### *iv. Instrumental Procedures*

Since Cannon (26) contributed his highly significant findings on bodily changes which attend keen emotional excitement in animals, noting that the states of pain, hunger, fear, and rage were accompanied by heightened activity of the heart beat, blood pressure, breathing, blood coagulation, adrenin secretion, and so on, and the corresponding inhibition of certain digestive processes (see Chapter V) the laboratory psychologist has industriously tried to detect the presence of an emotional state in the human being by means of the sphygmomanometer, the pneumograph, the plethysmograph, the psychogalvanometer, and other apparatus which will record inner physiological changes (correlated with emotional activity), and independent of the Subject's verbal or introspective report.

The changes which have been most easily and accurately measured are: Blood pressure, rate and depth of breathing, pulse (amplitude of heart beat), volume of blood and the psycho-galvanic reflex (perspiration) and basal metabolism. The bodily processes in the above list are susceptible to various influences, such as size of body, age, sex, metabolic processes going on within the body, ideational processes, position of body (standing, lying, *etc.*) variations in temperature, exercise, and other more obscure factors, any or all of which may affect the reading obtained. Hence it is not possible to compare findings with established norms; but readings can be taken before and after introducing the stimulus which in the laboratory is calculated to provoke an emotional response. It is this *change* in reading (before and after stimulation) which becomes significant to the Experimenter. Continuous records can be obtained by recourse to a kymograph, a revolving drum which records automatically the impulses which are transmitted to it through a tambour.

Of the above physiological processes which are known to correlate (among other things) with emotional changes, perhaps the two most interesting are blood-pressure and the psycho-galvanic reflex. These will be briefly described; accounts of others can be obtained in any good text in physiology.

The sphygmomanometer is made up of three parts: (a) a silk band which is to be wrapped rather tightly around the upper arm;

(b) a rubber bag to be inflated by squeezing a bulb which transmits an increase in pressure to the artery in the arm to such a degree that the brachial artery collapses and the pulse cannot come through; (c) a u-tube of mercury receives the pressure and affords a reading on a graduated scale. This records the amount of pressure required to collapse the artery. The reading at the moment when the pulse disappears is the systolic pressure. If, now the pressure is further increased, and allowed slowly to drop, the systolic pressure, on reappearance of the beat, can be checked.

The psycho-galvanic reflex has been under observation since 1888. It is due to a difference in potential at two points on the surface of the body, connected so as to form an electric circuit. Changes in polarization, affected by mental activity, emotional excitement, and other factors, alter the amount of current flowing through the circuit. This amount is measured by a galvanometer and recorded by a beam of light on a scale. The reading can also be set up to produce a continuous record on a photographic film.

The psychologist has worked long and hopefully with the psychogalvanometer, trying to secure a reading of amount of emotion felt or experienced, but he is not yet ready to claim success. The chief difficulty is that almost any kinds of excitement and activity, mental or physical, will cause deflections of the registering beam. The present status of the psychogalvanometer is summed up by Landis (91):

"A survey of the literature on the subject shows that these electrical phenomena have been considered by uncritically minded investigators to have necessarily a certain psychological importance. Either implicitly or explicitly stated, the argument may be put as follows: 'The reflex appears together with various psychical or mental events; hence it must have a mental correlate, or a controlling function.' As a matter of fact, this argument has thus far been demonstrated only by the method of proclamation." (p. 395) . . . "There is no conclusive evidence that would indicate that the psychogalvanic reflex is a measure of, regular criterion of, or indicator of, any one or combination of the traditional psychological categories." (p. 395) \*

A more hopeful outlook is taken by Darrow (31) who correlated the "Thurstone Neurotic Inventory" scores of thirty-five freshmen with their psycho-galvanic reflexes, and who found striking differences between the P. G. R.'s of the "neurotic" and "non-neurotic" individuals; also between the "extroverts" and the "intro-

\* From Landis, C. Psychology and the psychogalvanic reflex. *Psychol. Rev.*, 1930, 37.



verts" as classified. Introversion, however, was not identified with neuroticism.

Obviously much work still remains to be done in studying the physiological basis of emotion and the relation of physiological reactions to personality reactions. The worker interested in this relationship of blood chemistry, endocrine make-up and body metabolism, galvanic skin reflexes, *etc.*, should consult the original disciplines, as well as psychological literature, for further data. It is highly probable that such personality reactions as "nervousness," emotional tension, low thresholds for particular emotional stimuli, *etc.*, represent expressions of "simple biological dispositions." Discovery along this line would be of tremendous significance to the eugenicist.

#### *v. Pencil and Paper Tests*

Besides attempting to measure emotionality by instruments which seemed to promise great precision in detecting physiological changes the psychologist has also used the pencil and paper test. This has sometimes taken the form of a questionnaire, a rating-scale, or otherwise systematized outline for recording (1) the observed behavior of others, or (2) the Subject's own present or past experience of emotion.

#### The Pressey X-O Test of Emotions (132) \*

The Pressey Cross-Out Test was one of the earliest to be developed, and is much referred to in studies which appear in later chapters of this book. It uses words as stimuli and asks the Subject to respond according to his feeling. This test is divided into four parts; the first aims to uncover particular kinds of unpleasant feelings; the second is an adaptation of the Kent-Rosanoff Free Association Test (77); the third is an ethical discrimination test; the fourth is an attempt to uncover anxiety tendencies. Each section contains twenty-five line-lists of words. In the first list of unpleasant words, *e.g.*, "disgust, fear, sex, suspicion, aunt," the Subject is asked to cross out each word which is unpleasant to him. One word is a "joker," that is, it has no intrinsic tendency to call forth pleasantness or unpleasantness. In the second part, the stimulus words will suggest an association in the Subject's mind, which he is asked to indicate by naming the first word which occurs to him after noting the stimulus word. An example of this list is "blossom, flame, flower, paralyze, red, sew." Here, too, many unusual responses

\* Excerpts, by permission of C. H. Stoelting & Co., Chicago.

would indicate the presence of a pathological or criminal attitude. In the third part, the Subject underlines what he considers to be the worst offence in each list: Such as, for example, "begging, swearing, smoking, flirting, spitting." In the fourth, he underlines what he has tended to worry about, as, for example "injustice, noises, self-consciousness, discouragement, terms." This is aimed to uncover hypochondriachal and similar tendencies. After completing the test, the Subject is asked to go back and encircle the one word in each list which represents the extreme degree of his feeling. The test is scored in terms of the total number of words crossed out and encircled.

The Pressey X-O tests have been rather widely used especially on delinquents. Their validity and reliability are constantly being subjected to investigation (28). Chambers (27) found a small negative correlation with age, but an increase in medians from grade to grade. Tjaden (172) found no difference between responses of delinquents and college boys, but considers the tests important in "revealing constellations of ideas which have marked emotional content." Watson (184) finds that investigators agree on finding the idiosyncrasy score to be of more significance than the affectivity score; he stresses the need, however, of studying the *difference* rather than the gross score. The tests should be used with discretion and always in the light of all the evidence which is piling up for and against them. (27, 28, 40, 117-a, 118, 162)

### Temperament

Closely associated with the attempt to obtain a picture of the individual's emotional adjustment and balance, are the studies concerned over the "introverted" and "extroverted" as types. These terms were first used by Jung (71), since which time they have been the object of much study. In 1924, Freyd (42) summed up the traits which psychological and literary sources had accredited to each type. Freyd offers as his own definitions:

"Introvert: An individual in whom exists an exaggeration of the thought processes in relation to directly observable social behavior, with an accompanying tendency to withdraw from social contacts."

"Extrovert: An individual in whom exists a diminution of the thought processes in relation to directly observable social behavior, with an accompanying tendency to make social contacts." (pp. 74-5)

Freyd (42) gives a list of fifty-four items, descriptive of the introvert; the extrovert is characterized by the opposite of these traits. Sample items are here set down from his list:

1. The introvert limits his acquaintance to a select few.
2. He feels hurt readily; is sensitive to personal references.
3. He is suspicious of the motives of others.
4. He worries over possible misfortunes.
5. He is prone to self pity.
6. He gets rattled easily.
7. He avoids leadership; is retiring socially.
8. He is critical of others.
9. He prefers to work alone, away from people.
10. He has ups and downs of mood.\*

The concepts of intro- and extroversion have stimulated many studies as to their right to being placed in psychological categories. According to Newcomb (124) quoting Laird: "Introvert and extrovert traits are found in every one. . . . Introversion converges gradually into extroversion. . . . Most people are in the great converging zone, *i.e.*, at the mode of the curve." (p. 7)

"All of these studies agree that extroverts and introverts are not two distinct types, but that most individuals combine traits of both. Only at the *extremes* of the scale are the pure types found." (p. 12) The name "ambivert," by Conklin, would describe most individuals. (29) D. Thompson (161) on the other hand, empirically emphasizes the separateness of the two types.

L. Marston (100) has devised an intro-extroversion rating scale for preschool children, consisting of twenty items. Another scale, constructed to gauge these two aspects of personality for adolescents and adults, is "The Colgate Personal Inventory Form, C-2," by D. A. Laird. (89) It contains forty-one items; Subjects rate themselves. For a survey of the work on intro- and extroversion, the reader is referred to Guilford and Braly (52); for a criticism, to Watson (184) who represents the view of the statistically trained psychologist, namely, that two distinct "types" would imply a bimodal distribution directly contradictory to the expected normal curve of distribution.

#### *vi. Psycho-Neurotic Inventories*

The earliest, and still one of the best, systematic questionnaires on emotional stability, is Woodworth's "*Personal Data Sheet*," (201) consisting of 116 questions. This sheet was produced in war-time to assist in classifying soldiers according to personal emotional stability, supplemental to intelligence test scores. The *P. D.* sheet has since been revised by Mathews (101) for school children;

\* From Freyd, M. Introverts and extroverts. *Psychol. Rev.*, 1924, 31.



later by Johnson (69); by House (64); by Papurt (127); was examined for validity by Flemming (38, 39), and Garrett and Schneck (46), who recently published a study on the differential between 256 psychoneurotics of the War, and Columbia University Freshmen, in which forty-two of the 116 questions showed reliable diagnostic differences.

This *P. D.* sheet has also been included in a neurotic inventory, under the name of "*A Personality Schedule*" by the Thurstones. (170, 171) This inventory contains a list of 223 questions gathered from earlier schedules and reports, and represents the most extensive and effective personal data sheet yet compiled. It is scored to yield a single numerical index of the neurotic tendency of the Subject. The total score is the number of answers which showed maladjustment. A high score represents an unstable personality, neurotic in type. A low score represents a well adjusted individual. The Thurstones have confirmed earlier indications that psychopathic traits are associated with the more severe forms of emotional maladjustment. The degree of instability is distributed according to the normal curve.

Questions which differentiate neurotics from normals, can be judged by the following:

- Do you get stage fright?
- Do you have difficulty in starting a conversation with a stranger?
- Do you worry too long over humiliating experiences?
- Do ideas run through your head so that you cannot sleep?
- Are you troubled with the idea that people are watching you on the street?
- Do you have ups and downs in mood, without apparent cause? \*

The authors report a reliability of .95 for the whole schedule and of .90 for half of it.

The Thurstone "*Personality Schedule*" has met with adverse criticism from G. W. Allport (7) on the ground that it is too extensive, too all-inclusive, thus tending to wipe out individual trends and behavior traits. To the eugenicist, Allport's criticism would seem especially pertinent.

More recently a measure of personality attributes, especially those traits of introversion—extroversion, dominance, submission, self-sufficiency, and neurotic tendency, has been produced by Bernreuter (17) of Stanford. The test consists of 125 items adapted from previously mentioned tests and has a reliability of around .9

\* From Thurstone, L. L. and T. G. A neurotic inventory. *J. Soc. Psychol.*, 1930, 1.

for college students and almost perfect validity with the Thurstone, the Laird, the Allport, and Bernreuter's own earlier test.

Willoughby (197) also of Stanford, has produced a self-rating scale of emotional maturity, the *E-M Scale*, standardized on college students and scaled by percentiles.\*

### vii. Psycho-graphic Profile

#### The Downey Will-Temperament Tests

In spite of the constantly repeated criticisms of invalidity leveled against them, the Downey "*Will-Temperament Tests*" have drawn more attention to themselves than have any other series or battery of tests in the field of personality. Uhrbrock (174) lists no less than ninety-three titles of references to investigations or articles concerning their use or abuse. At present, an individual test and three group will-temperament tests are available, while still another, a non-verbal form, has been devised for investigation of racial differences.

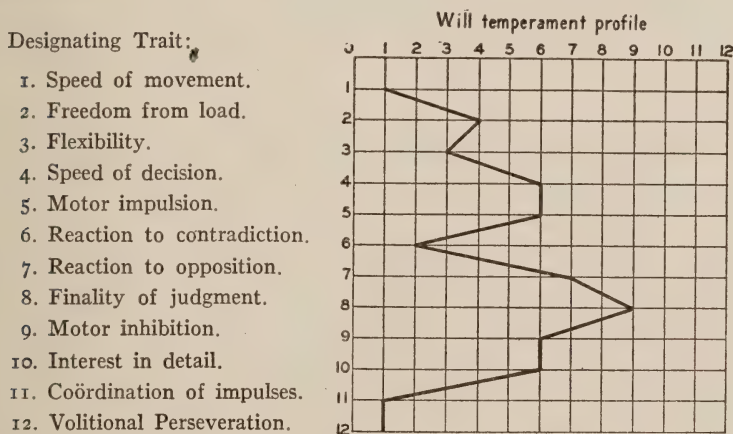


FIG. 19. SPECIMEN PROFILE OF DOWNEY WILL TEMPERAMENT.

According to Downey (33) all the traits of will-temperament may be included in three phases of personality; (a) speed and fluidity of reaction; (b) forcefulness and decisiveness of reaction; and (c) carefulness and persistence of reaction. By use of her "W. T." tests she hopes to ascertain "the general level of activity or

\* Other personality schedules: (1) G. W. and F. H. Allport (1928), *A-S Reaction Study*. Boston: Houghton Mifflin. (Form for men and a form for women) (2) R. Brotemarkle (1922), *Brotemarkle's Comparison Tests*, Chicago: Stoelting. (3) P. Lecky's (1931) *Individuality Record*, New York: Columbia University Press. (4) J. B. Maller's (1932) *Character Sketches*, Form A (Parts I & II separate). New

impulsion, the degree of inhibition, and the modes in which impulsion and inhibition function in an individual." (p. 59) Motor activity, as expressed through handwriting, is the main reaction called for, and distraction is an essential concomitant. The reactions are plotted graphically as in illustration. (Fig. 19)

As suggested above, the Downey tests have been shown to be inadequate by many investigators; the scores on the test show no relationship to ratings even when these latter have been most carefully made. This criticism, however, can be leveled against nearly all instruments purporting to test some trait or tendency. Such traits or tendencies, to be tested, must exist as characteristic *general* reactions, and not as *particular* reactions to specific circumstances. But as pointed out earlier, personal reactions are affected by conditions, and any one of a number of elements in the test situation may change the reaction. The student may be able to write quickly on the Downey tests, but solve mental arithmetic very slowly. Factors affecting responses include: Presence or absence of other people, the temperature, the freshness or fatigue of the Subject, the nearness to important events, past or future, the Subject's enthusiasm or indifference to the test, his "nervousness," and so on.

The common opinion of investigators (102) is that these tests do not measure any easily identifiable traits, and it is doubtful if they correlate highly with any character trait. May (102) reports Clark's findings of a lack of agreement between WT scores and conduct. The high correlation which is found between WT and intelligence serves in some degree to indicate the connection with intelligence as well as with temperament. However, May concedes that the WT tests are valuable in predicting whether an individual's response will be strong or weak, deliberate or impulsive, aggressive or its opposite, and the like. Roback's opinion (139) is that the Downey WT tests "are not yet safe guides in the hands of the tester, although their service in bringing out individual differences is not to be disputed." (p. 366)

Uhrbrock (174) points out that the reputation of the WT tests is based almost entirely upon the group form of the test, whereas Dr. Downey's own reports concern the individual form. He warns that the two forms are not comparable, and conclusions cannot be transferred from one form to the other. He also states:

York: T. C. Bureau of Publications. (5) P. E. Vernon and G. W. Allport, (1931) *Study of Values*, Boston: Houghton Mifflin. (6) F. H. Allport's (1924) *North Carolina Rating Scale for Fundamental Traits*, Chicago: Stoelting.



"There is evidence that the reliability of some of the tests may be increased considerably. Eventually a reliable, objectively scored form should be available for the measurement of non-intellectual traits. It may prove of distinct value in studying the characteristics of contrasted groups." (p. 64)

On the whole, until the more highly reliable form (promised in Uhrbrock's quotation) is produced, the present writer is disinclined to recommend the Downey test to research workers as tools of measurement for the discovery of traits. The WT test has been treated here at some length because of its historical importance, and because it has figured rather largely in some of the nature-nurture studies on twins. The reader is again cautioned against uncritical acceptance of findings on personality based on the use of this test.

### Social-Ethical Ideas, Moral Knowledge, Judgments

As has already been stated (pp. 105 f), experimenters early recognized opportunity for discrepancy between knowledge of right and wrong, and the effecting of principle in practice. Knowledge and act are not necessarily continuous phases of one process. (12) But as Hartshorne and May (59) point out:

"What a person says he feels and knows may have more far-reaching effects on others than what he really feels and knows. . . . The structure of civilization is based on assumptions of integrity and honor." (p. 362)

Hence, in trying to arrive at an all-round picture of a man's personality, it is well to include a test of the social-ethical, ideational type. Such a test, coupled with an objective conduct test, will supply an additional bit of information on his integration. For an example, the reader is referred to work done by the Character Education Inquiry.

## VI. GENERAL DISCUSSION

### A. OPINIONS ON TESTS OF PERSONALITY

It may be of interest here to present the point of view in regard to tests of a few psychologists who have studied the possibilities and limitations of personality testing.

Murphy (122) concludes:

"The physiological methods which seemed perhaps most exact have probably given the least information of all. The verbal methods which

rely upon *estimates* of one sort or another seem somewhat better. The direct manipulation of verbal materials has also seemed in several cases actually to give something worth while. The limitations of verbal methods have appeared not to be the direct and *intrinsic* difficulties of *all* verbal method; rather, they seem to be difficulties which arise from particular verbal methods in particular situations. When subject to precautions and proper analysis, the combination of verbal and behavior elements may present an amazingly successful differentiation of personalities from one another, the obtained results being far more definite and reliable than could *a priori* be expected. Psychologists have often shown a sort of excessive humility with regard to personality-testing devices equaled only by the excessive confidence which some of the early mental testers showed in the absolute dependability of the Binet scale. When at their best, personality-testing devices may do as well as intelligence tests." (p. 607) \*

Furfey (43) sums up his brief summary of standard tests for personality traits, by concluding:

"that such tests are markedly inferior to our best intelligence and achievement scales. They are so far inferior indeed that few if any of them are perfect enough to be of practical use except to research workers. But this review should show something more as well. It should show that in spite of their defects, these tests are being constantly improved, and that the day is not far distant when they can bear comparison with standardised tests of other types." (p. 23)

Roback (139) has this to say:

"At times, it appears as if the American studies of character traits by means of tests were a hit or miss affair, lacking the theoretical basis to begin with. The results are not apparently of the same type that we obtain in experiments on perception or in intelligence testing, but the investigations do seem to bring us closer to a general conception, and in spite of different starting points, there is a surprising uniformity at least with regard to the negative phases of character testing, so that new paths must be beaten out." (pp. 373-4) †

May and Hartshorne found that in their battery of some sixty-three tests, the two most promising methods for measuring character were *ratings* and *tests of knowledge and opinion*. They insist, however, that the best measure is to be obtained from a battery or composite of several tests; offering as one suggestion a group of ten ( $r$  is .75 with "character portraits"), and as another, a group of twenty-three ( $r$  is .81).

Theoretically, this is ideal; practically, the ratings and knowl-

\* From Murphy, G. and L. B. *Experimental social psychology*. Harpers, 1931.

† From Roback, *The psychology of character*. Harcourt, Brace, 1927.

edge tests, referred to above, yield almost as satisfactory results and are ever so much less expensive to administer. However, these workers are ready to concede that to obtain an adequate measure of personality as a whole, an equally wide variety of tests should be employed—tests for the different categories or approaches to the study of personality (as listed under case study, pages 103 f) but they insist that the use of them should be as objective as possible.

Symonds (1958) sums up testing possibilities thus:

"If personality is defined more narrowly, as it usually is by psychiatrists, so that it refers to the adequacy of personal and social reactions and adjustments, then the inquiry can be limited somewhat. Intelligence and aptitude tests will help define the general level of ability and special talents or defects. Performance tests can be used to obtain accurate information as to habits of persistence, inhibition, concentration, honesty, etc. Observation may be used to determine certain behavior characteristics either when among groups, as in a classroom, or singly while in an interview. Probably the greatest usefulness will be found in ratings, the questionnaire, and the interview for obtaining evidence as to adjustments toward the environment, personal evaluation, attitudes toward reality, sexual relationships, morals, and feelings. Finally, probing for dissociated complexes requires a more painstaking technique which involves free association and psychoanalysis." (p. 567)\*

## VII. SUMMARY

A survey of the literature indicates an interest in the study of personality which is as old as civilized man, but the "character test" as a measuring instrument did not appear until 1912. Testing efforts achieved their most recent culmination in the work of the Character Education Inquiry from 1924 to 1929. At the present time, many psychologists, here and abroad, are actively studying personality.

They are, however, not agreed on a central concept or definition of personality; they cannot as yet offer a real scientific analysis, or even basis, of personality; but they are most energetic in developing tests, scales, questionnaires, and other devices which help us to understand and record individual differences in personality.

Such attempts include direct observations, rating scales, questionnaires on interests, attitudes and social adjustments; pencil and paper tests of conduct, knowledge, and ethical point of view; performance tests in the same field; physiological measures of emotion; overt conduct reactions observed in test and during interviews. Still other methods are employed (largely by the psychiatrists), such as

\* From Symonds, P. M. *Diagnosing personality and conduct*. Century, 1932.



"free association," psycho-analysis, and both psychiatrist and psychologist make use of the more or less organized procedure known as the "case study" which involves a comprehensive gathering of information in regard to the heredity of the individual, his physical developmental history, and medical examination; tests of intelligence and special abilities; accounts of activities, interests, and companionships by parents, teachers, and friends; records of the Subject's achievement in school or vocation; and carefully planned questions on matters which would lead to an understanding of his social adjustment or emotional conflicts and complexes. This case study often represents what Symonds (158) calls "scientific synthesis," an assembling of results from experts and specialists along the different lines suggested, with a final analysis and interpretation of all the data.

Before personality tests are employed they should be examined for validity and reliability, in which they fall short of the standing reached by current intelligence tests. But at their best, they are most promising, steadily improving, and already of considerable diagnostic use in segregating individual differences in the clinic, the laboratory, and the schoolroom. For the larger aspects of population problems and social eugenics, their value is, as yet, questionable.

#### RECOMMENDED READING

##### *Summaries, Reviews and Bibliographies of Personality Studies*

- Allport, G. W. and Vernon, P. E., 1930. The field of personality. *Psychol. Bull.*, 27, 677-730. An analytical review of the methods and problems of research on the nature of personality, covering most of the important work of the past decade, especially that of the last five years. Bibliography of 327 references.
- Bogen, H., *Zum Problem der Personalität*, 1927. *Zsch. f. ang. Psychol.*, 28, 510-516. Reviews books on constitutional basis of personality.
- Fryer, D. D., 1931. *The measurement of interests*. New York: Holt. Pp. 488.
- Guilford, J. B. and Braly, K. W., 1930. Extroversion and introversion. *Psychol. Bull.*, 27, 96-107. Reviews the publications on extroversion-introversion.
- Hendrick, I., 1928. The analysis of personality. *Amer. J. of Psychiat.*, 8, 535-563.
- Hoffmann, H., 1926. *Das Problem des Charakteraufbaus*. Pp. 193.
- , 1928. *Charakter und Umwelt*. Pp. 106. Both published by Berlin: Springer. Reviews the work of Spranger, Müller-Freienfels, Weininger, Jung, Kretschmer, Klages, Apfelbach, Ewald, Kronfeld, Häberlin, and others.

- Jones, H. E. and M. C. Genetic studies of emotions. *Psychol. Bull.*, 27, 40-64. A review of literature in the field covered by the title.
- Lipschütz, A., 1925. *Innere Sekretion und Persönlichkeit, Jahrb. d. Charakterol.*, 2/3, 229-259. A survey of the endocrinological studies of personality.
- Maller, J. B., 1932. *Character and personality tests*. New York: T. C. Bur. of Pub. Pp. 53. A descriptive bibliography of some 300 tests.
- , 1933. Studies in character and personality in German psychological literature. *Psychol. Bull.*, 30, 209-232.
- Manson, G. E., 1926. A bibliography of the analysis and measurement of human personality up to 1926. Reprint and circular series of the *Nat. Res. Council*, No. 72.
- May, M. A. and Hartshorne, H., 1925. Objective methods of measuring character. *Ped. Sem. and J. of Genet. Psychol.*, 32, 45-67. An analysis of all objective attempts to measure character to date, considering the claims of the tests, their techniques and scoring devices, the norms by which scores are interpreted, the validity and reliability of the tests, and their "raw symptomatic value," or degree to which the tests measure what they claim to measure. Includes a bibliography of references to tests and articles on tests developed before 1925.
- May, M. A. and Hartshorne, H., 1926. Personality and character tests. *Psychol. Bull.*, 23, 395-411, 196 references.
- and Welty, R. E. Personality and character tests. *Psychol. Bull.*, 1927, 24, 418-435, 150 Ref.
- , 1928, 25, 422-443, 146 Ref.
- , 1929, 26, 418-444, 199 Ref.
- , 1930, 27, 485-494, 127 Ref.
- Watson, G. B. *Psychol. Bull.*, 1932, 29, 147-176, 171 Ref. These articles and bibliographies are published yearly, listing references to books and articles in the field of personality, with a very brief descriptive account of new tests and techniques and devices for measuring various aspects of character and personality. These summaries constitute an excellent lead to source material in this field.
- Murphy, G. and L. B. *Experimental social psychology*. New York: Harpers, 1930. Pp. 709. A comprehensive organization of research on social influences on personality.
- Symonds, P. M., 1932. *Diagnosing personality and conduct*. New York: Century. An excellent compendium of the varying approaches to the study of personality. Reviews research through 1929; includes liberal samplings of test materials.
- Weiss, L. A., 1933. Rating scales. *Psychol. Bull.*, 30, 185-208.
- Exhaustive Accounts of Research, etc.*
- American council on education, 1933. *Measurement and guidance of college students*. Baltimore: Williams and Wilkins. Pp. 199.

The following three volumes in "*Studies in the Nature of Character*," are the reports of the work projected by the Character Education Inquiry, on a grant from the Institute of Social and Religious Research to study the influences and experiences of school children by the objective method of character measurement. The investigators were primarily interested in measuring conduct under "controlled conditions" in situations which are considered to have a social and moral significance.

Hartshorne, H. and May, M. A., 1928. *Studies in deceit*. New York: Macmillan. Book I, Pp. 414; Book II, Pp. 306. Contains a bibliography of forty-eight references on previous methods of detecting and measuring deceit; a description of the methods used by the Character Education Inquiry for measuring cheating; also methods for measuring lying and stealing.

——— and Maller, J. B., 1929. *Studies in service and self-control*. New York: Macmillan. Pp. 559. Contains further accounts of the work of the C. E. I.—the attempt to measure conduct, as understood under the terms "coöperative and charitable behavior, altruism, self-control, persistence, and inhibition"; and an examination of factors such as age, sex, school, environment, *etc.*, which may influence the expression of these tendencies. Contains detailed account of the tests developed by C. E. I. to measure objectively those aspects of conduct; also, a bibliography of references to previous attempts at measurement in these fields.

——— and Shuttlesworth, F. K., 1930. *Studies in the organization of character*. New York: Macmillan. Pp. 503. A study of the integration of character or consistency of performance and behavior or stability of moral conduct. Contains account of efforts to measure social intelligence and social attitudes, including a survey of previous attempts at measurement in this field; and a description of the tests developed by the C. E. I. on moral knowledge and opinion, social attitudes, environmental background and social functioning, reputation, *etc.* The usual elaborate statistical analysis of test results and interrelations of influences accompanies the tests. The last three chapters present a "comparatively untechnical summary of the general results, as interpreted by the directors of the project."

### *Historical Approach to the Understanding of Character*

Roback, A. A., 1927. *Psychology of character*. New York: Harcourt Brace. Pp. 595. An excellent treatise in scope and content; reviews historical interest in character from both the literary and scientific points of view; contains references to foreign works of many nationalities; and presents a detailed analysis and theory of character according to the author's own point of view.



*Journals*

The following journals are given over largely to the study of some aspect of character or personality:

*Character and Personality*, Duke Univ. Press, Durham, N. C. Also *Panverlagsgesellschaft*, M.b.h., Berlin, W9. "An international quarterly for psychodiagnostics and allied studies."

*J. of Abnormal and Social Psychology*, Eno Hall, Princeton, N. J.

*J. of Social Psychology*, Worcester, Mass.; Clark Univ. Press. (Political, race and differential psychology.)

*Religious Education*. "A journal devoted to the development of character through the family, the church, the school and other community agencies." Published by the Religious Education Association, 59 East Van Buren St., Chicago.

*Zeitschrift für Menschenkenntnis und Menschenschicksal*, Düsseldorf, Germany. Bi-monthly.

*Zeitschrift für Menschenkunde. (Blätter für Charakterologie und Angewandte Psychologie.)* Colle, Germany. Monthly.

The following journals are concerned with child behavior, differential and genetic psychology:

*J. of Genetic Psychology*. Worcester: Clark Univ. Press.

*Child Development*. Baltimore: Williams and Wilkins Company.

The following journals are interested in personality from the standpoint of the personnel worker:

*Personnel Journal*. Baltimore: Williams and Wilkins Company. Monthly.

*Vocational Guidance Magazine*. Cambridge, Mass.: Harvard.

The following journal deals largely in case studies, and from the clinical standpoint:

*Psychological Clinic*. Philadelphia: Psychol. Clin. Press.

The following journals reflect the psychiatrist's interest:

*Amer. J. of Psychiatry*. Baltimore: Johns Hopkins Press.

*The Amer. J. of Orthopsychiatry*, 145 E. 57th St., New York City.

*Mental Hygiene*, 370 Seventh Avenue, New York City.

The following journals contain summaries of articles published in psychological literature; useful to trace down studies:

*Psychological Abstracts*, Eno Hall, Princeton, N. J.

*Psychological Bulletin*. Princeton, N. J.: Psychol. Review Co.

*Psychological Index*. Princeton, N. J.: Psychol. Review Co.

COMMITTEES AND PERSONNEL INTERESTED IN THE STUDY OF PERSONALITY

*Character Education Inquiry*. This was an extensive investigation directed by Dr. M. A. May and Dr. H. Hartshorne, and supported by a grant

to Teachers College, Columbia University, from the Institute of Social and Religious Research. It existed as a research organization from 1924 to 1929, its work being reported in three volumes and many articles in periodicals. (See under "Bibliography") Both men are now at Yale University, where Dr. May has assumed the position of Executive Secretary and Director of Statistical Bureau for the Yale Institute of Human Relations. Dr. Hartshorne is research professor in divinity.

*Committee on Personality Measurement of the American Council on Education.* Washington, D. C. This committee operates in the interest of the personnel worker largely, and reports of its work are to be found in numbers of the *Personnel Journal* and other publications.

*Committee on Personality Traits and Community Factors in Juvenile Delinquency.* This is a sub-committee of the Social Science Research Council, with Dr. E. W. Burgess, of the University of Chicago, as chairman.

*Ethological Society*, 57 Wimpole St., London, England. This society, founded in 1904, and now under the presidency of Dr. B. Hollander, is concerned with the systematic study of character.

*Research Station in Character Education*, under the Graduate College and Department of Philosophy and Psychology, of the University of Iowa. It was founded in 1923, has been financially assisted by the Institute of Social and Religious Research, and is under the chairmanship of Dr. E. D. Starbuck.

*Developers of Test Materials, and Students of Personality in U. S. A.*  
F. L. Allport, Syracuse University, Syracuse, N. Y. (Theory and problems)

G. W. Allport, Harvard University, Cambridge, Mass. (Theory and problems)

P. H. Furfey, Catholic University, Washington, D. C. (Developmental age)

H. Hartshorne, Yale University, New Haven, Conn. (Character tests)

E. Heidbreder, University of Minnesota, Minneapolis, Minn.

D. A. Laird, Colgate University, Hamilton, N. Y.

C. Landis, New York State Psychiatric Institute, Medical Center, New York City. Research Associate. (Studies in psychogalvanometer)

M. A. May, Yale University, New Haven, Conn. (Character testing)

F. A. Moss, George Washington University, Washington, D. C. (Social intelligence and personality studies)

G. Murphy, Columbia University. (Extensive review and organization of the literature on personality)

A. A. Roback, Boston, Mass.

E. D. Starbuck, Iowa University, Iowa City, Iowa. (Theory and problems)

P. M. Symonds, T. C., Columbia University, New York City. (Bibliographic research and analysis)

- L. L. Thurstone, University of Chicago, Chicago, Ill.  
 M. F. Washburn, Vassar College, Poughkeepsie, N. Y.  
 G. B. Watson, T. C., Columbia University, New York City. (Theory and tests. Director of Character Consultation Clinic)

Effective work in character studies in child development centers is being done by the following:

- J. E. Anderson, Institute of Child Welfare, University of Minnesota  
 W. E. Blatz, St. George's School, University of Toronto, Toronto, Canada  
 A. Gesell, Yale Psycho-Clinic, Yale University  
 F. L. Goodenough, Institute of Child Welfare, University of Minnesota  
 B. Johnson, Johns Hopkins, Baltimore, Md.  
 H. E. and M. C. Jones, Inst. of Child Welfare, University of California  
 A. Stoddart, E. L. Vincent and R. Stutsman, Merrill-Palmer, Detroit, Mich.  
 D. S. Thomas, Institute of Human Relations, Yale University  
 B. Wellman, Child Welfare Station, University of Iowa, Iowa City, Ia.

The following are interested in discovering unique abilities or traits:

- T. L. Kelley, Harvard University, Cambridge, Mass.  
 D. Paterson, *et al.*, University of Minnesota, Minneapolis, Minn.

Psychiatrists especially interested in personality studies are:

- E. R. Jaensch, and his students (Bio-types) Marborg (Germany) Inst. of Psychology.  
 E. Kretschmer (Body types) Marborg, Germany  
 H. S. Sullivan (Schizophrenics)

Sociologists:

- E. Burgess, University of Chicago  
 C. Shaw, University of Chicago  
 W. I. Thomas, New York City  
 F. M. Thrasher, University of Chicago

Behavior Problems in Children:

- W. S. Healy and A. F. Bronner, Judge Baker Foundation, Boston, Mass.

The various Institutes for Child Guidance in different American cities

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## CHAPTER III

### DEFINITION OF THE PROBLEM OF HEREDITY AND ENVIRONMENT AND THE GENETIC BACKGROUND





## DEFINITION OF THE PROBLEM

"The genes initiate the process of development and determine its sphere and limits."

GESELL

A controversial aspect often clouds the discussion of the relative effects of heredity and environment on human characteristics. It is in part due to failure properly to define the issue, which is not one issue, but many, as we shall presently see; and in part to failure, or present inability, to reach any exact definition of the characteristics under discussion. And we must add to these difficulties the fact that the various sciences which contribute the evidence only commenced their existence twenty or at most thirty years ago and are still untried ground to scientists in adjoining fields. It is therefore desirable, before considering the material in the chapters which follow, to attempt to define the problem and to note the limitations placed on our efforts by present inadequacies in the methodology and in the knowledge content of the contributing sciences.

### A. THE SCIENCE OF GENETICS, HUMAN HEREDITY

Mankind has been interested in heredity from earliest times, but until 1900, if we omit the work of Mendel, no field was more speculative. Lamarck in his *Philosophie Zoologique* of the early nineteenth century propounded the theory of use and disuse and the inheritance of acquired characters. He postulated that species are not immutable. In the years just prior to 1859, when Charles Darwin gave to the scientific world his great treatise on evolution, the *Origin of Species*, both Darwin and Wallace simultaneously offered the theory of Natural Selection based largely upon the Lamarckian idea of acquired modifications and their inheritance.

Lamarckism and Darwinism, while offering an explanation of variation, failed to account for any mode of inheritance. Darwin offered a theory of Pangenesis and of circulating gemmules which later and more thorough scientific experiments have entirely discounted. The Lamarckian idea of inheritance of transformations acquired by use or disuse has been largely discredited, more by the work of Weismann than by any other single scientist. It is to his

credit also that is due the theory of continuity of the germ plasm and its isolation from the somatic influences. A fourth theory which recognizes, as Lamarck did not, that variations do not always arise by gradual and slight cumulative changes, was that of Hugo de Vries, who at the turn of the twentieth century gave to the world the theory of mutation to explain the sudden occurrence of significant variations. But in all this important scientific literature we find no explanation of the actual mechanism of inheritance. It is to the Austrian monk, Gregor Mendel, whose writings lay forgotten and unappreciated for three decades, that we owe our greatest debt. As a result of systematic experiments in breeding peas in his garden, Mendel postulated a mechanism of heredity, and suggested the laws of segregation and free assortment of the genes.

In the early years of the twentieth century these two ideas, rediscovered, led to an immense progress in the study of genetics so that in the last thirty years, through the remarkable researches of Morgan and his associates on the *drosophilae*, of Castle on hooded rats, of breeders of plants and animals throughout the world, the mechanism of heredity has been ascertained for species after species—and the gene, or carrier of hereditary characters, is now, in the words of Morgan “a conception as real and as reasonable as the concept of the atom.” As a result of experiments embodying exact quantitative data, comparable in extent to the data employed in the determination of the laws of physics and of chemistry, it has been possible to formulate the theory of the gene. The theory states that the characters of the individual are referable to paired elements (genes) in the germinal material, that are held together in a definite number of linkage groups which correspond to the number of the paired chromosomes (larger elements visible in the microscope); it states that the members of each pair of genes separate when the germ cells mature in accordance with Mendel’s first law, and in consequence each germ cell comes to contain one set only; it states that the members belonging to different linkage groups assort independently in accordance with Mendel’s second law; it states that an orderly interchange (crossing-over) also takes place at times between the genes in corresponding linkage groups; and it states that the frequency of crossing-over furnishes evidence of the relative position of the genes in each linkage group with respect to each other.

Thus, not only is the general mechanism of heredity now pretty clearly understood, but certain laws or principles (six or more to date) have been deduced from quantitative experimental data,



which laws define the processes of this mechanism; and experiments running into several millions of individuals, over many successive generations, have been used to check their validity.

This amazing accumulation of knowledge in genetics has been made in its entirety since 1900; very much of it since 1915, and it is perhaps not too much to say that its extent and exactitude, and its implications, are not yet widely understood, even by scientists in other fields.

It is true that this knowledge refers only to physical characteristics, and has been fully determined only in the case of certain lowly organisms, and that in the case of man there is as yet no large accumulation of evidence. Yet, as step by step genetic experiments have been extended to include different and higher forms, the results have never been such as to disprove the existing theory in its general outlines.

No serious student of heredity today can doubt that the mechanism of heredity in man is the mechanism of the gene and the chromosome, operating under laws generally similar to those which have been definitely ascertained for the organisms which have to date been studied in detail. It is obvious that man is not susceptible to the kind of experimentation which has made possible our knowledge of the genetics of the little fruit fly *Drosophila*. Morgan estimates that of the cell of *Drosophila* contains over 4000 genes; of these some 400 have been connected with the particular characteristic, or characteristics, which each effects or determines, and have been located as to the chromosomes they occupy and as to their position relative to each other. The experimental work involved in these determinations goes through many generations and innumerable individuals, and is extraordinarily exact; nothing like it is possible with human beings, and many trained geneticists look with skepticism on the attempt to determine the mechanism of heredity with respect to any of the characteristics of man. Nevertheless, when a marked characteristic appears in successive generations, or as a result of certain types of matings, there is often good ground for deducing what type of heredity mechanism is involved and whether the designated genes are recessive or dominant. Studies of this sort are at their best when the characteristic is one which is sharply defined, and either appears or does not appear in the individual. Thus the extensive genetic studies which have been made on eye color, haemophilia, and many other characteristics, indicate pretty definitely their Mendelian character, and in some instances the exact method of transmission.

With a few exceptions, the characteristics which are clearly defined and about the mechanism of whose inheritance we are most certain are pathological in their nature. It is probably fair to say in respect to those on which serious genetic studies have been made, that they are little affected by such differences in environment as may normally be found between population groups or individuals in this country.

The characteristics about whose method of inheritance we are least certain, or know nothing, are for the most part those which vary within rather wide limits and so are not clearly defined. Studies in genetics *per se* can throw little light on whether this variability is due to differences in the heredity or differences in the environment, or a combination of both; indeed, the variability of such characteristics as vitality, body-build, and intelligence, which prevents their exact definition, throws an almost insuperable difficulty in the way of exact genetic study. For such characteristics—and they are among the most important in any large population group—the problem of environmental effects is best approached in a different way.

#### B. ANALYSIS OF THE HEREDITY-ENVIRONMENT PROBLEM

The list of human characteristics is a long one, and from even a limited observation we can note that the form and content of certain characteristics appear to be little affected by environment after birth, while the form of others may be much affected. As for instance, the pigmentation of the eye is not noticeably affected by changes in light conditions, such as enormously affect the pigmentation of the skin, although in a fixed environment the eye colors vary as between individuals as much or more than skin color. The cephalic index (ratio of width of head to length) appears only slightly, if at all, affected by environment, while the body weight may be much affected. Such simple observations lead us to the conclusion that the range, within which hereditary tendencies may be varied by environmental factors, is different for each characteristic.

We may note also that some characteristics are extremely susceptible to even slight changes in environment, while others are modified only by wide variations in its intensity, or in length of exposure. If we think of each environment as lying within an upper and a lower extreme, between which extremes, life or the development of any particular characteristic is possible (but impossible below or above either extreme), we might measure the intensity of any particular environment by the extent to which it lay above or

below the median line separating the two extremes: but this would require exact methods for measuring the environment, which for many environments are not yet available; and would require a difficult appraisal of the different factors in each environment. For the present no such exact studies are possible.

It would appear then that each human trait possessed its own range of variability under the influence of environment, and a different susceptibility to environment; some characteristics varying widely with slight changes in environment, some varying widely but only with extreme changes in environment, and others varying within very narrow limits, and each with a different susceptibility. Looked at in this light, the problem of heredity and environment is not a general problem, but is specific to each characteristic and to each environmental factor.

We would like, if it were possible, to find out for each separate human characteristic: Within what limits can it vary under the influence of environment? And, what is its relative susceptibility to environment?

But, unfortunately, there is another complication. *Homo sapiens* is the most hybrid of all breeds, and we have no reason to believe that any two men are the same in the range or limits, and the susceptibility, of their different characteristics. The problem of heredity and environment must therefore be thought of not only as specific to each characteristic and to each environment, but as specific to each individual in respect of each of his characteristics, and to each factor of his environment.

There may be as many different answers to this problem as there are different human beings, and different characteristics, and different environments. We cannot speak of a good or of a bad environment except in terms of a particular characteristic and of a particular individual, and of particular environmental factors. The best we can hope to do on any general study is to find out what are the extremes of variation and the average variation of a population, in respect to each of its characteristics, and the various environments to which they are subject, and we must limit our study to the following questions:

In respect to any given population and any given differences in environmental factors: What is the central tendency (median and interquartile range) and what are the individual extremes of range for each characteristic studied? And,

To what extent are variations within this range related to differences in environment?



Such, then, is the problem, and such are the questions we would like to be able to answer in these pages.

#### C. LIMITATIONS INHERENT IN PRESENT KNOWLEDGE AND METHODOLOGY

We have seen that the solely genetic approach is limited to sharply defined characteristics.

When a characteristic is one which in any related group of men varies within wide limits, the problem must be approached with exact instruments for measuring variations in the characteristics, and variations in the particular environment involved. In the preceding chapters we have examined the present status of methods of measurement of psychological characteristics.

Measurement of intellectual abilities is sufficiently advanced to make possible valuable studies in this field.

Measurement of special mental characteristics (*i.e.* unique traits and special abilities) is recent and has not yet resulted in any large number of studies.

Measurement of personality traits is just reaching the point at which studies of practical value are possible, but the difficulties are very great.

Anthropometry still lacks adequate measures for some of the physical characteristics in which we are most interested, such as vigor or vitality, resistance to disease, *etc.*

We have not reviewed methods of measuring the environment, for they are yet in their infancy. A promising start has been made in developing scales for measuring factors in the environment which may influence the development of general intelligence. But in the studies which follow the differences in environment can be stated only in the most general terms.

Existing knowledge and methods are sufficient to make possible valuable studies on the relation of environment to intelligence, and on the relation of environment to certain physical characteristics. From them we may find, in respect to a few characteristics, a partial answer to the problems we have stated. And more important still, we may find ground for hope that further work will enormously increase the amount and the exactitude of our knowledge.

The chapters which follow present some of the more important studies on intelligence and personality.

## CHAPTER IV

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## I. INTRODUCTION

### A. STATEMENT OF PROBLEM

#### *i. Explanation of Terms*

This chapter is in general concerned with what might be called the basis of intelligence. By "intelligence" we will have in mind, as far as possible, that mental power which is necessary to score on standardized tests of intelligence, particularly on the Stanford-Binet, since this is admittedly our most reliable and valid instrument of measurement. We might call this type of reaction either "test intelligence," "mental test performance," or, reverting to the usage in psychological literature, simply by the term "general intelligence." \* The extent to which such "test intelligence" agrees with the layman's concept of "general intelligence," when judged by social, educational, and other practical criteria, has already been discussed on pages 58 to 70.

Units of measurement of such "general intelligence" are sometimes reported in: (a) Raw scores on such and such a test; (b) Mental Age, or, more simply, M.A., denoting sheer mental growth; and (c) Intelligence Quotient, or I.Q., which denotes the amount of test intelligence an individual has in relation to his fellows of the same age. The "I.Q." has the advantage in that it serves as a measure of individual differences at any age, and hence, by its classification, children of all ages can be grouped and compared.

This chapter is particularly concerned with how much certain factors in the environment aid in fostering, or developing, or stimulating the development, of "test intelligence." The kind of environmental factors we have in mind include such influences on the growing mentality as: The cultural status of the home; the sanitary conditions of the community; the earliness of exposure to formal schooling; the efficiency and extent of schooling; nearness to, or

\* It is unfortunate that psychologists have not followed the precedent of physicians, biologists, botanists and other scientists in evolving their own terminology to cover concepts already labeled by the general public. A restrictive scientific nomenclature would do away with much of the confusion and agitation stirred up in the public mind when popular interpretation of the mental operations referred to coincides loosely, or at times only vaguely, with what the technical psychologist has in mind.



remoteness from urban life; language handicaps or advantages; exposure to accidents or disease; nutrition; health and physical condition; growth factors in the human organism, and so on.

## *ii. Selection of Material*

It is our desire to present a summary of the major existing studies in this field. Of necessity, such a survey of research implies selection, since it would be patently impossible within the limits of a single chapter to cover all the work which has been done in this field. We shall try to choose for reference only those studies which best meet the rigid requirements of scientific method, including especially such procedures as the use of accurate tools of measurement; adequate isolation or "control" of the factors studied; techniques of analysis of data, allowing for influence of other possible variables; interpretations based on sound judgment in the light of all the conditions inherent in each study.

## *iii. Weakness of Earlier Controversial Approaches*

In the past many different approaches have been made to this problem, employing methods which at one extreme were highly biased, being often merely emotional expressions or subjective speculations; and at the other extreme, a straightforward controlled gathering of objective factual data, which in turn are analyzed by impersonal statistical techniques. Small wonder if conclusions could not be harmonized! Solution has been further handicapped because, as Terman (125) states, findings may tend to violate deep-rooted political predispositions:

"Now any proposal to apply in practice the doctrine of the biological inequality of human beings, whether in politics or education, impinges upon some of our deepest-lying prejudices and challenges our fundamental philosophies of life. . . . Rightly or wrongly, some have felt that educational democracy is at stake, and any threat, fancied or real, against the democratic ideal of public instruction arouses antagonism as a threat to the democratic principle of political control."  
(p. 1)

Many of the earlier studies and research projects, although carried out in all sincerity and scientific integrity on the part of their authors, have since been discredited. This is in part due to the evolution of new methods of research, which recognizes certain spurious factors entering into earlier experiments; more accurate tools and instruments for measuring not only mental but environmental content; a growing knowledge of the complications which

must be guarded against in the interpretation of data; and, lastly, each new research to some extent closes the gate on the last, each new set of findings affords a point of departure for the next. We feel that a presentation of a few recent reliable studies embodying past wisdom is worth more than a complete array of earlier projects.

However, in order to orientate the reader with regard to the problem and to give him some rational explanation for certain popular misconceptions, still entertained by the world at large, a very brief historical account will be included, following which there will be set down the most approved modern methods for studying the contribution made by environment toward the development of "test intelligence."

## B. HISTORICAL BACKGROUND

### *i. The Family History Studies*

The scientific approach to this problem is relatively recent. Not until 1869 did an investigator, Francis Galton (60), attempt to gather data to throw light on what was then called the "heredity-environment" issue. Galton showed that high ability tended to cluster in certain families. Later (61) he stressed the significance of studying the resemblance which obtained for the two kinds of twins. In 1877, Dugdale (43) published his observations on the continual reappearance of certain undesirable psychological characteristics within one family. This was supplemented in 1915 by Estabrook (48) who continued the Dugdale investigation. Goddard (76), in 1912, traced the diverse mental qualities of two lines of descent springing from a common ancestor who had contracted two unions, the one with a high grade, the other with a low grade partner. Woods (223) in 1906, traced certain mental and moral trends in the royal families of Europe over a three century period. In 1913 Woods (224) became interested in the family background of nominees to the Hall of Fame. Cattell (24), in 1921, published a statistical study of American men of science. These studies all revealed the presence of resemblance, but since both heredity and environment were shared by the relatives, no special credit could be assigned to heredity alone in causing such resemblance.

More recently, within the last ten years, and especially within the last five, workers have studied the effect of specific environmental influence by the experimental method. Studies by Freeman (125) of Chicago, by Burks (125) in California (both published in 1928); by Lawrence (113) in England (published in 1931)

measured not only resemblance, but also environment, and the effects of a change in environment in altering native expectations of resemblance. Within the last decade, also, have appeared a large number of investigations into the power of certain physical factors of accident, disease, *etc.*, in altering I. Q.

## *ii. Recency of Experimental Approach*

This very brief presentation will suffice to show the reader that emphasis in the earlier works was directed toward not only an analysis of mental qualities appearing in the individuals studied, but to the recurrence of these qualities among various collaterals or forebears of the individual. With the possible exception of Galton's research on twins, no direct attempt was made to investigate the influence of environment, in and of its own force, to help develop these qualities. Such an approach was reserved for the sociologists and experimental psychologists of the last decade.

The earlier "family history studies" were handicapped, also, in that their investigators had no means of actually measuring the qualities traced, but were forced to resort to opinions, ratings, character judgments, and other fallible devices. The more recent studies, on the other hand, are able to employ more precise measuring instruments, tests, and scales, in gathering their data. These data in turn have profited by improvements in statistical methods of analysis and treatment; and consequent interpretation of the significance of various measures of relationship which have been uncovered.

It is chiefly this dependence on tools of measurement which has delayed the experimental attack on the problem. Our chapters on measurement reveal the highly recent appearance of tools and tests for measuring psychological characteristics. These tests made their initial appearance within the teens and twenties of the present century; their employment in the study of environmental influence falls well within the last decade; indeed, a count of the dates of issue of the scientific studies would locate most of the projects and research publications in the period after 1925.

Fig. 20 shows the recency of the more significant research contributions, including articles and books published since 1900.

## C. MODERN METHODS OF STUDYING EFFECT OF ENVIRONMENT

It is now recognized that an adequate study of the influence of environment has proceeded by one or more of four general approaches.



(i) The traditional procedure, as stated before, was to select Subjects within one level of intelligence, *e.g.*, geniuses, feeble-minded, or any stated range in between, and then to trace both the hereditary and environmental influences which have been at work to bring these individuals to similar levels. Similarly modern studies

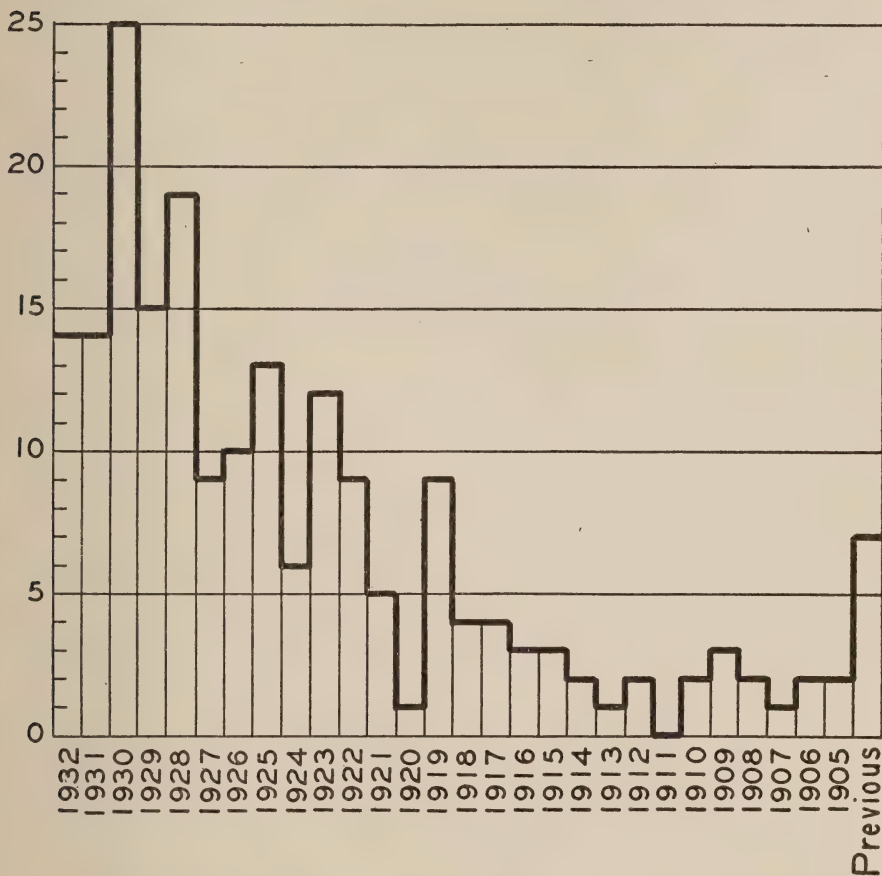


FIG. 20. FREQUENCY OF RESEARCH STUDIES ON HEREDITY-ENVIRONMENT, ACCORDING TO PUBLICATION DATES.

have also been reported by Terman (195) and more recently by Cox (31). Theirs is essentially the method employed in the earlier "family history" studies, but with more attention paid to possible environmental influences.

(ii) A newer approach is to find Subjects whose heredity is identical (identical twins), or similar (siblings and other relatives), but whose environment has been different. This presupposes a

separation of the similar individuals at birth, or very soon thereafter, before environment has had an opportunity to exert much force. Obviously, such instances of separated twins, siblings, parents and children, are hard to find. This approach would include also members of certain socio-economic groups who have left the social level into which they were born, as would happen when lowly born children are adopted into superior homes, or when socially well-born families have met with misfortune and have been reduced to poverty.

(iii) The third approach would hold environment constant, but would vary the heredity. This would include groups of individuals from all strata of society, reared in a common home or institution, such as is to be found in an orphanage or foundling hospital. The chief difficulty here is that usually these wards come not from widely different levels, but from *one*—generally the lowest level of society.

However, this approach (varying heredity with environment constant) includes a second set of Subjects as material for study; namely, children adopted by foster parents, particularly in those homes in which there are other children, against whom the unrelated child can be contrasted and compared. Foster children can also be compared with foster parents for mental resemblance.

(iv) Growing out of the knowledge of expected intelligence for various groups, the fourth approach, an experimental attack, takes two groups of Subjects, matched for level of test intelligence, social background, and other important factors which might influence the development of test intelligence; then by introducing the new or "training factor" to the experimental group, it observes what effect if any is produced, which does not show up in the control group, of originally similar "test intelligence." This latter method, because of the comparative ease in securing two matched groups, has been the most widely employed. It is not necessary by this plan to know hereditary backgrounds of the Subjects, but merely to know how much intelligence the Subjects have by test before the new factor is introduced.

#### *v. Discussion of Difficulties Involved in Above Methods*

The limitations of the first plan have already been discussed. The second plan mentioned above, namely, keeping heredity constant and varying environment, requires two or more Subjects of similar heredity before effects can be studied. Since identical twins constitute our only homologous or genetically identical human race.

they are very important material to the student of mental inheritance and environmental influence. Consequently, considerable attention will be paid to them in this discussion. Much less adequate, from the standpoint of having similar heredity, are siblings. The heredity of siblings is similar only in proportion to similar assortment of parental genes. Identical distributions of genes of course rarely, if ever, occur, but for experimental purposes *matched sibling groups* can be considered as roughly equal. The fourth plan, that of "equating groups" and using test-retest findings, is straightforward, but limited to group study; by its use we derive very little knowledge of factors affecting the individual.

## II. STUDIES ON THE RELATION OF INTELLECTUAL RESEMBLANCE TO DEGREE OF KINSHIP AND VARIATION IN GENERAL CULTURE

### A. HEREDITY SIMILAR

#### *i. Twins*

##### THE GENESIS OF TWINS: THEIR CLASSIFICATION

It is a matter of common observation, even among the non-trained observers, that twins can be strikingly alike in appearance, or else strikingly different. Because of the almost unconsciously accepted fact of human variability and individual differences, the fact of twin resemblance, when it does occur, is always a matter of note and interest to the layman; so much so, that he tends to associate the concept "resemblance" with the concept "twin." Hence, when twins appear who do not resemble each other closely, the ordinary observer tends to exaggerate their lack of resemblance. Actually, "unlike" twins are no more different from each other than are ordinary brothers and sisters, born on different dates. It is merely the contrast with almost perfect resemblance in some twin pairs which makes the rather unlike pairs seem extremely different. Hence, the statement above might, in truth, be modified to read: Twins may be strikingly alike in appearance, or may resemble each other no more than do ordinary siblings,—brothers and sisters born at different times.

This range of twin resemblance runs all the way from almost complete identity, through stages of being "somewhat alike," "a little less alike," and "considerably different," to "very different"; much as a series of sibling pairs would line up when matched for



resemblance to each other. The only exception to the distribution of resemblance would be that phenomenon, occurring at one extreme, where "almost complete intra-pair identity" is noted. Such community of resemblance (where one member is commonly mistaken for the other one) is almost never met with between ordinary sibs; it is only in twins that such striking likeness is found, and in twins, as noted above, it frequently occurs.

Students of twinning believe that there are two classes of twins: Identical and fraternal. The former are often referred to in technical literature as: Similar or duplicate, homologous, uniovular, monozygotic, monochorionic. Twins of this class are always of the same sex, either both male, or both female, and so much alike that sometimes even their own families cannot "tell them apart." The other group, the "fraternal twins" are referred to as: Dissimilar, non-identical, heterologous, binovular, dizygotic, dichorionic. They may be of the same sex, either both male, or both female, or of different sexes, one male and the other female. They may be no more and no less alike than are ordinary brothers or sisters, which means that sometimes they resemble each other rather closely, and sometimes so little that their relationship to each other would not be detected by strangers.

#### Mode of Genesis of Identical Twins

One aspect stands out to distinguish the two groups, namely, the factor of sex. Identical twins are always of one sex; fraternal twins may, or may not be. This in itself suggests a different mode of genesis for the two types of twins. It is well established that in all higher forms of animal life the sex of a fertilized ovum is determined by the presence or absence of a particular chromosome, called the X chromosome. The fertilized ovum which has two X factors (XX) develops into a female; that which has a single X factor, or an X factor with a corresponding Y factor develops into a male. No single fertilized ovum or zygote contains both XX and XY pairs. Therefore, no single ovum will become both male and female. Hence no fertilization which results in both male and female could be the development of one ovum alone; a uni-sexual gestation may be the development of one ovum alone, or of two ova; a bi-sexual gestation must be the parallel growth and development of two separately fertilized ova. In support of this theory as to the differential genesis of the two kinds of twins is the evidence that fraternal twins have as a rule separate placentae and separate foetal membranes.

Identical twins, on the other hand, are generally born with one placenta and enclosed in one chorion. This immediately suggests that they are the result of the germination of one ovum, which by some variation of cell division has become two separate germinal bodies, each perfect in itself, and able to achieve perfect embryonic development. This is the generally accepted theory to which most of the evidence seems to point, although some authorities have suggested other possible modes of genesis. (71)

### Proportion of Twins of Different Classes

If all twins were of fraternal (*i.e.*, of two ova) origin, then boy-boy, mixed, and girl-girl pairs should occur approximately in the ratio 1 : 2 : 1 by the normal laws of chance. The number of twins of like sex would be approximately equal to the number of mixed pairs. By extensive observations, however, it has been found that about sixty-two or sixty-three per cent of all twins are of like sex, a proportion which would be accounted for if about twenty-five per cent of all twins, or about forty per cent of all like-sex twins are identical twins (*i.e.*, of uniovular origin). (87, p. 18) In actual studies this proportion is found to prevail. (128, 130, p. 9)

### Causes of Variation in Identical Twins

#### 1. Asymmetry

Few individuals are in any strict sense bilaterally symmetrical. One side of a profile presents a different outline from the other; one ear may be slightly larger, longer, fuller; one leg heavier; the finger and palm prints on one hand quite unlike those on the other; and so on for almost every paired structure in the body. The most generally accepted theory to account for the differences between identical twins is based on this normal asymmetrical tendency of the individual.

It is believed that twin division may take place either very soon after the ovum has been impregnated by the sperm, or relatively late in the germinal developmental process. If it occurs early, then both of the two newly-formed entities will have an even chance of symmetrical development; if it occurs late, then the chances for asymmetrical development become great; the later the age of "splitting," the more pronounced the asymmetry of the twins. In some stages twinning occurs so late in the embryonic stages that complete separation is not achieved, and conjoined or "Siamese" twins are born. Other abnormalities, monsters, *etc.*, can be explained on similar bases.

Newman (132), a foremost authority on twinning, infers that: . . . "Twinning in man takes place in close association with, and possibly as an aberration of, the process of establishing and fixing the relations of symmetry and asymmetry in the embryo." (p. 312)

"If then, we may assume that conjoined twins with the most extreme reversal of asymmetry in the inferior component, represents one end of the series of twins, it is natural to assume that the opposite end of the series is represented by cases in which twinning is consummated before any asymmetry is established. In such cases the twins would be derived from two equivalent primordia which had not yet been differentiated into right- and left-hand sides. When, later, asymmetry comes to be established in these two genetically equivalent and still undifferentiated embryos, it should follow the same course in both and each should develop the same asymmetry as the embryo would have done had it not undergone twinning." (p. 312) \*

Twinning may occur late after a bilateral individual has been established, at which stage complete twinning is impossible, resulting in partial twinning, double monsters, "profound reversal of asymmetry, *situs inversus viscerum*."

The earlier that twinning occurs with respect to establishment of symmetry, the more similar should the resultant twins be, and the less should they show evidences of asymmetry such as left-handedness and counter-clockwise hair whorl. This explains why the criteria of asymmetry reversal are rarely present in the most strikingly similar twins, and are increasingly common among identical twins that are less similar.

## 2. Prenatal Influences

Developmental correspondence between twins may be affected by relative positions *in utero*. It might happen that the relative position of the two fetuses with respect to the vascular blood supply is not symmetrical, that one twin is placed in a better position, both in regard to arterial and venous circulations, than the other. The more favorable nutritional advantages lead to better physical growth of one at the expense of the other. This intra-uterine advantage alone would account for one twin being taller, stronger, healthier than the other at birth. Sometimes this initial handicap is later overcome by the weaker member; sometimes it is never equalized, and the twin, disadvantaged pre-natally, retains this relative rating throughout life, in spite of later post-natal environmental assistance.

\* From Newman, H. H. Studies of human twins. *Biol. Bull.*, 1928, 55.



### 3. Other Factors

Newman (131) who noted frequent asymmetry in the quadruplets of the nine-banded armadillo, states that besides heredity and environment there may be a third or "distribution factor," associated with the mechanism of cell division and body formation. This factor would involve some profound inaccuracy in the supposedly exact mechanism of mitosis, which should equally distribute hereditary materials to all cell products of a single zygote. Whatever the third factor is, call it developmental inaccuracy if you will, it tends to interfere with the degree of resemblance between twins and is consequently to be thought of as explaining a considerable part of the failure of the quadruplets to show complete identity.

#### Mode of Genesis of Fraternal Twins

The genesis of fraternal twins, on the other hand, offers practically no problem, being simply the fertilization of two separate ova by two separate spermatozoa. This differential distribution of paternal and maternal chromosomes to the twins results in twins that are as dissimilar in make-up and appearance as are ordinary siblings. Yet, sometimes, it is to be conceded, they are strikingly alike. There are a few cases in which the twin expert is challenged in his diagnosis of mono- or dizygosity of the twins before him.

#### Summary of Resemblance

We have noted, then, several points in regard to twin resemblance: (1) That there is a continuous gradation in resemblance between twins from almost complete duplication to rather great difference. (2) Two groups of twins have been distinguished: (a) uniovular, and (b) binovular; but within each group gradations of resemblance are noted. (3) Within the uniovular group this generalization holds less than within the binovular, for in the former group there is a "bunching" towards the extreme of identical resemblance. Within the entire range of all twins taken as one group this tendency is also noted.

#### Methods of Diagnosing Type of Twins

If there is a gradation from very great resemblance to comparatively little resemblance for both the identical, or uniovular group, and the fraternal, or binovular, how is it possible to tell to which group any particular set of twins will belong?

At first glance one would have said that those twins who are of

the same sex and who resemble each other are monozygotic. But this does not necessarily hold true because about sixty per cent of all like-sexed twins are fraternal, and by chance some of these fraternal may occasionally resemble each other very closely in appearance as siblings sometimes do. On the other hand, twins of opposite sex, even though they resemble each other closely, may be automatically classified as fraternal or dizygotic.

### Diagnostic Criteria

Twin experts, such as Newman of Chicago, state that in the large majority of cases they are usually able to tell at a glance to which group any pair of twins belongs. In cases in which doubt is felt various criteria are resorted to before a final classification is established. Of these criteria no one by itself is clearly diagnostic, but in conjunction they afford a reliable basis for classification.

It has been commonly assumed that monozygotic twins, sometimes referred to as monochorionic, are invariably enclosed in one chorion during the gestation period. This evidence is available only at the time of birth and unless recorded then by the obstetrician is of little use to the later student of twin Subjects. Even if the information is available it is not infallible, as evidence of uniovularity. Arey (3, 4) and Newman (136) point out the rare occasion when two chorions fuse into one. In addition, Newman (136) brings evidence to support the stand taken by Curtius (32), the German authority on twinning, that whereas dizygotic twins are invariably dichorial it does not follow that monozygotic twins are always monochorial. Newman (132) reminds us that previous studies indicate that twenty-five per cent of all twins, or forty-two per cent of like-sex twins, are monozygotic. He cautions that if widely different percentages are reported for any single large collection the probability is that incorrect diagnoses were made.

Newman (132) has drawn up a list of criteria for diagnosing identical twins, which combines the best features of previous methods:

- "1. They must be strikingly similar in general appearance including various intangible resemblances.
2. They must be essentially identical in hair color, texture and form.
3. They must have the same shade of eye-color and form of iris.
4. They must have the same skin color and texture (complexion) except when one is more tanned than the other.
5. They must have no marked differences in features; shape of ears; shape, size and arrangement of teeth.
6. They must have hands of the same type and nearly equal in size.

7. The general microscopic character of the papillary ridges in fingers and palms must be essentially the same.
8. There must be stronger cross resemblance than internal resemblance in one or more of the details of finger and palm patterns.
9. The presence of reversed asymmetry in handedness or hair-whorl in one twin is confirmatory evidence of monozygosity, but its occasional presence in unlike twins is not to be taken as an indication of monozygosity." (p. 290) \*

The presence of a single placenta, even though attached to two chorions, is generally considered strong evidence of uni-ovularity, but it sometimes happens that two placentae, though present, became so fused together during gestation that it is impossible to tell their singleness, and hence this evidence is not altogether reliable. (168)

Much reliance has been placed on the very close resemblance to be noted in palm and sole prints of identical twins, but here again exceptions must be allowed for. Wilder (214), who stressed this exceedingly close resemblance, has also indicated that in obviously duplicate twins the resemblance in palm, finger, and sole prints was often not striking. Newman (132) feels that in similarity of palm and skin patterns is to be found "the best single diagnostic aid; not so much between the two hands of one person, as between the corresponding hands of the two members of a twin pair."

He writes:

"Specifically the right hand of one twin is more like the right hand of the other than like his own left hand, and the left hand of one twin is more like the left hand of the other than like his own right hand. Thus, cross resemblance between the two twin individuals is stronger than resemblance between the two hands of the same individual. . . . *In every pair of obviously monozygotic twins, the rule holds, that there is stronger cross resemblance between the hands of one twin and those of the other, than between the two hands of the same individual.*" (p. 291) \*

#### METHODS OF MEASURING TWIN RESEMBLANCE

The tools of measurement used in twin studies have ranged from mere verbal report in the days of Galton (61), to the unsatisfactory tests of Thorndike's (199) early study made before intelligence tests were available, to Merriman (121), who was the first to use our most acceptable present-day measure of mental ability, the Stanford-Binet. To secure more extensive data than can be obtained by individual testing, Lauterbach (112), Wingfield (218,

\* From Newman, H. H. Studies of human twins. *Biol. Bull.*, 1928, 55.



220), and others used group methods of estimating intelligence. Reliability was held to be increased in Wingfield's data by averaging the I. Q.'s from several group tests (a proceeding in itself questionable).

Most of the recent studies on twin resemblance, including those of Thorndike, Merriman, Averill and Muller (5), Wingfield, Hirsch (86), Bakwin (9), Baldwin and Ewert (11), and Brintle (18), and individual case studies, tend to give individual scores on all tests, so that other interested workers can re-assemble these data and view them from new angles of analyses.

Correlation techniques are used in the majority of twin researches, with and without due allowance for factors which might account for such resemblance other than the variable under consideration. Doubtless future investigators will take cognizance of the effect of age and variabilities of their groups, as well as of reliabilities of their tools of measurement. The method of finding the *average* intra-twin differences for various twin groupings (like sex, unlike sex, fraternal, identical, *etc.*) has been employed by Merriman, Tallman, and others. Formulae have also been offered, or critically commented upon, by Thorndike, Merriman, Shen (177), Wingfield, and Holzinger (92) for estimating the degree of resemblance between two members of a pair. The degree of similarity for different types of twins has been plotted by Thorndike and Merriman. Gesell and Thompson (74), and Strayer (190) have approached the problem of separating the influence of inherent growth factors and training factors by the experimental co-twin control techniques. Page (142) has contrasted developmental parallelism of identicals with fraternal. Holzinger (92) calls attention to the need to note the effect of nature and nurture on the *variability* of intra-pair differences as well as on their *averages*, and offers statistical formulae for determining these effects. His formulae have been questioned by Kelley (102).

But whatever the methods used in the various studies which will now be presented, the findings in each case should be interpreted only in the light of conditioning facts of each investigation, to which we will attempt to draw the reader's attention.

### THE MAJOR STUDIES ON TWINS

The first student to point out the value of twin material in the study of mental heredity was Francis Galton (61). In 1883 he gathered facts on twins who were alike in babyhood to learn whether the years lessened the resemblance or not. If resemblance

became less with the years, Galton sought explanations from the families concerned. He was equally interested in twins

“ . . . who were exceedingly unlike in childhood, and (to) learn how far their characters became assimilated under the influence of identical nurture, inasmuch as they had the same home, the same teachers, the same associates, and in every other respect the same surroundings.” (p. 218)

Here is an expression not only of Galton's recognition of two types of twins, but of his appreciation of their significance in contributing to a better knowledge of the influence of environment in determining mental ability.

If monozygotic twins (or as Galton expressed it, those springing from “two germinal spots in the same ovum”) of common heredity become less alike as they grow older, and perhaps separate to different places of residence, their later differences can be attributed to the selective forces of environment. If dizygotic twins, born quite unlike, later grow to resemble each other under similar educative influences, then this final similarity will indicate the effect of environment acting on dissimilar genetic structures. If they continue to remain different in spite of prolonged residence together, then their difference would be an index of the relative impotence of environment to make two natures alike. Corollaries which follow are: (a) The greater the difference in environment for two members of a monozygotic pair, the better the opportunity to note the potency of environment to alter original nature; and (b) the longer the period of similar training for dizygotic twins, the greater the opportunity to note how training can influence unlike natures to become alike. (See page 186)

Galton, who carried out his studies in the pre-measurement era, gathered his information by the questionnaire method. His plan was to send out a “circular of inquiry,” after which he was largely dependent upon such voluntary information, fact and anecdotes, as his informers chose to give—persons who were either twins themselves, or the near relatives of twins. Many of the answers were inevitably inaccurate, colored by personal bias or interpretation, and subject to the usual errors of verbal report, subjective rating, and questionnaire data. Galton attempted to make allowances for unconscious exaggerations in his evidence and to group his data into rough categories by a primitive graphic method. His conclusions, set down below, were based on information on thirty-five “similar” pairs of twins, and on twenty “dissimilar” pairs. These answers to

the "circle of inquiry" sent out by Galton led him to conclude that an extremely close similarity in "body and mind" existed between "similar" twins, not only during childhood, but beyond adulthood as well. He comments that even differences of taste, when reported, were usually matters of intensity or energy, rather than of intrinsic difference. Or, as he writes regarding one pair of twins:

"The more vivacious might be subdued by ill-health until he assumed the character of the other; or the latter might be raised by excellent health to that of the former. The difference was in the key-note, not in the melody." (p. 232)

Serious illness or accident seemed to account for what differences existed in adult characters, rather than the "combined action of many small differences."

For dissimilar twins, he writes:

"I have not a single case in which my correspondents speak of originally dissimilar characters having become assimilated through identity of nurture . . . here, the causes conducive to assimilation began to act from the earliest moment of the existence of the twins, when the disposition was most pliant, and they were continuous until the period of adult life. . . ." (p. 240)

Galton's final remarks attest his point of view:

". . . The impression that all this evidence leaves on the mind is one of some wonder whether nurture can do anything at all, beyond giving instruction, and professional training. . . . There is no escape from the conclusion that nature prevails enormously over nurture when the differences of nurture do not exceed what is commonly to be found among persons of the same rank of society and in the same country." (pp. 240-41)

Galton's conclusions rather than any analysis of his actual data have been set down here because, lacking modern measuring tools and methods, his data are not exactly comparable with those of more recent studies; but these conclusions, in spite of handicaps and imperfections of measurement, are remarkably in line with those of a very considerable group from among the modern investigators.

Twenty-two years after Galton's initial investigation into the mental resemblance of mono- and dizygotic twins, Thorndike (199, 200) took up the reins. It was in the era of the "mental test," but not of the "intelligence test"; that is, special measures of isolated mental processes, such as adding, subtracting, canceling letters, *etc.*,



were available, but the test of "general intelligence" awaited a later period. However, Thorndike's work is an advance on Galton's in that he employed direct measurement of his twins rather than verbal report and family anecdotes; and in that he used statistical formulae to measure intra-pair resemblance. Incidentally, Thorndike's research included as additional aims: Investigation of the mode of genesis of twins; of specialization of inheritance of traits; and the relation between mental and physical inheritance.

Thorndike's line of analytical reasoning was much like that of Galton's, but extended somewhat beyond the earlier worker's. Briefly summed up, his reasoning is as follows:

In so far as mental resemblance is due to training: (a) Twins aged thirteen and fourteen should be more alike than twins aged nine and ten years. (b) Siblings, not over four or five years apart should show as close a resemblance as twins, since environment for such sibs will be as similar approximately as it would be for twins. (c) Twin resemblance in traits much subject to training (arithmetic) should be higher than in traits least subject to training (marking off "a's" on a sheet).

Conversely, in so far as resemblance is due to inborn factors: (a) Young twins should resemble each other as much as older twins. (b) Homologous twins should be more alike than ordinary siblings born of different ova. (c) Resemblance in untrained activities should be as high as resemblance in activities requiring a high degree of training.

With these premises in mind to guide his thinking, Thorndike proceeded to give objective tests to fifty pairs of twins, found in the school population of New York City. His tests covered, among other things, the following mental processes: (a) Those which he considered as least subject to training; cancellation of words, letters and misspelled words. (b) Those traits which, according to Thorndike, were much subject to training,—addition, multiplication, and finding the opposite of words.

Thorndike introduced several devices for measuring mental resemblance between two members of a pair: (a) Comparing intra-twin resemblance with intra-pair resemblance of two children selected at random. (b) Amount and direction of deviation of each member from the central tendency for age and sex.

The first device has been and still is employed by students of twin resemblance; the second device has been subject to much criticism, especially by the next research worker, Merriman (121), who offered a substitute formula which, in its turn, was revised

by Shen (177). In addition, Thorndike's assumption of the cumulative effect of environment in reënforcing twin resemblance at older ages has been criticized by Burks (125) and defended by Kelley (125). Burks comments as follows:

"A pageful of citations could be presented in which some statement such as this is made: 'It is fair to assume that the longer environment acts, the greater is its effect.' By the use of this basic assumption, elaborate 'proofs' are sometimes built up to show that environment can or cannot account for such and such observed facts. The assumption may or may not be true; again, it may be true under some conditions, false under others; it is far from axiomatic. Thus, in some situations, it would seem at least as reasonable to postulate that environment quickly accomplishes its maximal effect, and if constant thereafter, is powerless further to add or detract." (p. 25)

Kelley (125), however, in reviewing the article takes issue with Burks' criticism and argues that environmental influence must be proportional to the change, as judged by the growth of average individuals, that has taken place in the function during the time through which the environment has acted. Elsewhere (102) he estimates that environmental influence, negligible at birth, increases to fifty per cent by middle age; hereditary influence decreases from 100 per cent at birth to fifty per cent at middle age. (p. 440) This point is worth bearing in mind.

In spite of disagreements in regard to Thorndike's logic, inadequacies of his statistical formulae, and immaturity of his mental tests—all a function of the pioneer period—nevertheless Thorndike's conclusions, in general, compare favorably with the findings of later workers who have had the advantage of more refined techniques and equipment.

Thorndike's major conclusions are set down as summarized by him.

(a) Twins and sibs:

"The resemblance of twins in mental traits is roughly twice that of ordinary siblings." (p. 6)

TABLE 5  
THE RESEMBLANCE OF TWINS AND SIBLINGS COMPARED \*

Ability	Coef. of Corr.	
	Twins	Siblings
"A" test .....	.69	.32
"Word" test .....	.71	.29
"Opposites" test .....	.90	.30

\* From Thorndike, 199, p. 6.

## (b) Older and Younger Twins:

"The older twins show no closer resemblance than the younger twins and the chances are surely four to one that with an infinite number of twins tested, the twelve-to-fourteen-year-olds would not show a resemblance of .15 greater than the nine to eleven-year-olds." (p. 7)

TABLE 6  
THE RESEMBLANCE OF YOUNG AND OLD TWINS COMPARED \*

Ability	Twins 9-11	Twins 12-14	Twins 9-11	Twins 12-14
	Corrected Coefficients		Raw Coefficients	
1. "A" test .....	.66	.73	.58	.67
2. Word test .....	.81	.62	.62	.49
3. Misspelled word test .....	.76	.74	.76	.74
4. Addition .....	.90	.54	.83	.46
5. Multiplication .....	.91	.69	.81	.53
6. "Opposites" test .....	.96	.88	.79	.78
Marks in 1, 2, & 3 combined....			.71	.69
Marks in 4, 5, & 6 combined....			.90	.75
Averages .....	.83	.70	.75	.64

\* From Thorndike, 199, p. 7.

Inspection of the above table reveals that the younger group would have its mid-point at ten years, the older at thirteen, a difference of three years. Since each group straddles a three-year range in itself; since the numbers in each group were small—thus lowering the reliabilities of any obtained differences between the two groups; and more particularly, since the growth curve slows down as children grow older; and as shown in later data (pp. 305-06); since environmental effect decreases with age, the differences which Thorndike found with the inadequate measuring instruments at his disposal cannot be considered by later psychologists as highly significant evidence of the power of environment, in and of itself, to modify original nature.

## (c) Mental (Native and Acquired) and Physical Traits:

"The difference between the traits most subject and those least subject to training is no greater than the median difference between any one trait of the six and any other. Surely there is no evidence here of any large contribution from similarity of training to similarity of achievement." (p. 7)

"If then, the mental resemblances of twins were almost entirely due to original nature, we should expect them to be only slightly in excess of the resemblances in physical traits. The existence of the latter as a fact may properly be taken as a partial verification of the former as a general hypothesis." (p. 8)



Or, in other words, since the measure of mental resemblance (average  $r = .76$ ) so closely matches the measure of physical resemblance (average  $r = .76$ ), it may be inferred that original nature accounts as much for the mental likeness as it does for the physical.

TABLE 7

THE RESEMBLANCE OF TWINS IN MENTAL AND IN PHYSICAL TRAITS \*

No.	Mental Traits	r.	No.	Physical Traits	r.
"Native"	1. "A" test .....	.69	11.	Cephalic index .....	.76
	2. Word test .....	.71	12.	Height-sitting/ht. ....	.76
	3. Misspelled word test.....	.80	13.	Height .....	.78
	4. Addition .....	.75	14.	Height/sitting .....	.83
"Acquired"	5. Multiplication .....	.84	15.	Circ. of head.....	.75
	6. "Opposites" .....	.90	16.	Width of head .....	.86
	7. Combined mark, 1-3 .....	.70+	17.	Arm length .....	.72
	8. Combined mark, 4-6 .....	.82+	18.	Finger length .....	.71
	Median of 1-6 .....	.78		Median of 11-22.....	.76
	Average of 1-6 .....	.78		Average of 13-18.....	.77
	Average of 7-8 .....	.76		Median of 13-18.....	.77
				Median of 11-18.....	.76
				Average of 11-18.....	.76





\* From Thorndike, 199, p. 9.

#### (d) Summary:

"The mental resemblances of a twin pair are about twice as great as those of a pair of siblings similarly chosen; are as great or nearly as great in the case of the younger as of the older half of the group; are as great or nearly as great in the case of the A, word, misspelled word, and opposites tests as in the case of addition and multiplication, and are only slightly if at all greater than resemblances in physical traits which could have been caused in some cases, only by original nature." (p. 8)

The one conclusion drawn by Thorndike (not listed in the summary) which has not stood the test of time and later research, has to do with the classification of twins into one *versus* two types. Thorndike sought to throw light on the question by plotting his measures of individual pair resemblances. He obtained from these data a unimodal and not a bimodal curve of distribution, a curve which, however, was "bunched" toward the direction of almost complete identity.\* On the basis of this unimodality, involving a con-

\* The results of combining two distributions, one of which follows the normal curve (fraternal), the other of which has almost zero variability, at a point corresponding to an extreme variation from the mean of the normal curve (identical) would give both the gradation and the bi-modality.

Thorndike's curve was like this:  being "of the somewhat common type where a trait is very variable but has its mode close to an absolute limit of some sort." (p. 50) If his fraternal curve were like this:  and his identical like this:  the combined would then be like this: .

Distribution of fraternal likeness, however, while it shows less bunching toward

tinuous series of gradations, Thorndike argued for the existence of a one-type classification of twins; later research, especially in the field of Genetics which in the day of Thorndike's study was almost non-existent has opposed Thorndike's contention. Majority opinion among both psychologists and biologists is on the side of two types: Fraternal and identical.

The next study of historical importance was undertaken by Merriman (121) nineteen years later. Merriman's aims were: (a) To study the effect of environment on the intellectual resemblance of twins; and (b) to gather psychological data to enlighten the biological question of a one or two-type twin classification. In pursuing his objectives, Merriman was guided largely by the arguments of Galton and Thorndike on deductions to be made in regard to influences of original nature and training on intellectual differences and resemblance.

Although Thorndike employed objective measurements to study twin resemblance, Merriman's study was the first to use standardized tests of intelligence. Merriman secured the Stanford-Binet mental test records of 105 pairs of twins; National Intelligence Test records for 143 pairs; Army Beta scores for 76 pairs. He also included some teachers' ratings.

To measure the degree of resemblance, Merriman, like Thorndike and Galton, made use of Pearson's correlation coefficients; he also found average differences between two groups on the several tests employed, and charted these differences for his various groupings (like-sex, unlike-sex, siblings, *etc.*). In addition, he made use of certain devices offered by Pearson and Elderton (150) to be applied to distribution curves, to discover whether the two curves represented similar groups or two distinctly different groups; to see, in other words, whether the whole group of twins was a homogeneous one, or whether it included two types: Identical and fraternal twins.

Merriman also studied individual pair-resemblance, offering, as a substitute for Thorndike's method, a special adaptation of the Pearson product moment formula for calculating such individual pair-resemblance. The derivation of this formula is given, and seems to be more valid than Thorndike's method; but this latter method, in turn, is criticized by Shen (177), who points out with statistical

the zero end, does not however "follow the normal curve," *e.g.*, see page 57 of this volume. Like the ordinary sibling curve, the fraternal curve shows greater incidence of resemblance than does the distribution of resemblance of unrelated individuals; this would make Thorndike's results understandable because of some degree of heredity in common.

elaborations that Merriman's formula is not applicable to all of his cases.

Other criticisms of Merriman's data are that he did not eliminate the effect of age or common growth, on amount of resemblance; nor did he allow for the range and variability of his groups, both of which factors would affect the size of his correlation coefficients. However, since Merriman was far-sighted enough to publish all his raw data, it has been possible for others to rework his data and to make new calculations therefrom. Shen (177), in 1925, found the standard deviations of Merriman's various groups on the Stanford-Binet I. Q.'s, and also calculated standard errors of estimate.

Some of Merriman's results and conclusions will be set down briefly, but their original tabulation will be adhered to as much as possible. His findings on Stanford-Binet resemblances are grouped as follows:

TABLE 8  
INTELLECTUAL RESEMBLANCE OF YOUNG AND OLDER TWIN PAIRS \*  
(Correlation on Stanford-Binet test)

	Number	Binet r.
All twin prs. ....	105	.782 $\pm$ .025
Prs. 5-9 yrs. ....	47	.809 $\pm$ .032
Prs. 10-16 ....	58	.757 $\pm$ .037
Like sex prs. ....	67	.867 $\pm$ .020
Do. 5-9 yrs. ....	29	.882 $\pm$ .028
Do. 10-16 ....	38	.865 $\pm$ .027
Girl-girl prs. ....	40	.857 $\pm$ .029
Girl, 5-9 yrs. ....	19	.915 $\pm$ .026
Girl, 10-16 ....	21	.814 $\pm$ .050
Boy-boy prs. ....	27	.877 $\pm$ .030
Boys, 5-9 ....	10	.800 $\pm$ .078
Boys, 10-16 ....	17	.890 $\pm$ .034
Unlike sex pr. ....	38	.504 $\pm$ .081
Do. 5-9 yrs. ....	18	.774 $\pm$ .064
Do. 10-16 ....	20	.298 $\pm$ .137

\* From Merriman, 121, p. 47.

N.B. Merriman, unfortunately, did not draw any correlations for "similar" twins, even though similarity would have had to be established on the basis of pre-formed judgments.

From the above correlations, Merriman (121, p. 46) concluded that environment makes no significant contribution to the amount of twin resemblance.

Before setting down other conclusions reached by Merriman, it might be advisable to introduce at this juncture the work of Shen (177), who, after pointing out certain flaws in Merriman's treatment of his data, offered new calculations of his own, purport-



ing to correct the weakness inherent in Merriman's interpretations. Shen's special criticisms were directed toward the following points:

1. "Reliability measures should have been reported, together with the correlation, so that the cause of the imperfect correlations could be properly divided between chance and true differences of the members of the twin pair.

2. "The effect of age should have been taken into consideration, (Binet excepted). The correlations do not show what proportion of the resemblance is attributed to factors other than a common age or growth.

3. "The range of scores for the different groups should have been mentioned." \* (p. 601)

### Shen's Rearrangement of Merriman's Data:

Table No. 9 taken from Shen, shows what Merriman's values would be when the range and variability of the distributions are accounted for. (Larger variabilities make for larger coefficients.) Since the variabilities of Merriman's several groups are not all the same, the resulting coefficients cannot be considered as altogether comparable. To allow for variation Shen calculated the standard deviations of Merriman's Binet I.Q.'s, and also the "standard errors of estimate." His table shows that the older twins are a more

TABLE 9

CORRELATION COEFFICIENTS, S. D.'S, AND STANDARD ERRORS OF ESTIMATE OF MERRIMAN'S DATA \*

	$r$	$\sigma$	$\sigma\sqrt{1-r^2}$
All twin pairs .....	.782	15.1	9.4
Pairs, 5-9 years .....	.809	13.0	7.6
Pairs, 10-16 years .....	.757	16.3	10.6
Like-sex pairs .....	.867	16.5	8.2
Like-sex, 5-9 years .....	.882	13.4	6.3
Like-sex, 10-16 years .....	.865	18.2	9.1
Girl-girl pairs .....	.857	15.9	8.2
Girl-girl pairs, 5-9 years .....	.915	15.0	6.1
Girl-girl pairs, 10-16 years .....	.814	15.4	9.0
Boy-boy pairs .....	.877	16.6	8.0
Boy-boy pairs, 5-9 years .....	.800	9.7	5.8
Boy-boy pairs, 10-16 years .....	.890	19.6	8.9
Unlike sex pairs .....	.504	12.4	10.7
Unlike sex, 5-9 years .....	.774	12.2	7.7
Unlike sex, 10-16 years .....	.298	11.6	11.1

\* From Shen, 177, p. 602.

\* In this connection, Shen refers his readers to an article by Otis and Knowlin, called "The reliability of the Binet scale and of pedagogical scales," in the *J. of Educ. Research*, 1921, 4, 121-142, in which example is given of the change in correlation values of a reliability coefficient on the same test. As groups of different ranges were considered, these coefficients became: .85, .44, -.14, and -.62. This example bears testimony to the importance of taking into consideration other factors than the variables in question which might influence the value of the correlation coefficient.

variable group, except in the case of the unlike-sex group, where the coefficient is low for the older age group. The standard deviations, he finds, balance the irregularities of the coefficients, and the resulting errors of estimate are consistent; showing in every case an increase of three points from younger to older. This, Shen states, might be attributed to any of three causes: (1) the decreasing reliability of the I.Q.; (2) the increasing variability of the I.Q.; and (3) the increasing effect of the environment from lower to upper ages. He mentions statistical devices for checking these possibilities by re-test.

#### Merriman on Twin Classifications:

It will be recalled that one of Merriman's objectives was to obtain psychological data to enlighten the question of whether twins were to be considered as of one or two types. Merriman concluded that his data attested to two distinct types. This was shown in various ways: (a) The correlation coefficient (his measure of resemblance) was always higher between like-sex twins than between unlike-sex, thus showing closer resemblance.\* (b) The coefficients between sibling pairs were much more like the coefficients between unlike-sex twins than those between like-sex twins. (c) By the use of curve fitting formulae he found a probability of twenty-seven to one (on Stanford-Binet data) and a probability of forty to one (on National Intelligence Test data) that the two groups (like-sex and unlike-sex) represented two types.†

Further interesting data are to be found in his analysis of individual pair resemblance. By use of an adaptation of the Pearson product-moment formula ‡ Merriman (121) obtained measures of

\* The present writer is at a loss to explain the extremely high coefficients which Merriman found for his like-sex group, in view of the fact that this group by the law of chance must have contained some ordinary fraternal twins.

† In this connection it must be borne in mind that the like-sex group included both fraternal and identical twins. If this group were composed of identical twins exclusively (on basis of empirical judgments), the differences would have been even more pronounced. Merriman had no way of selecting true identical twins from his collection, and did not treat of them separately.

‡ Regarding Merriman's use of his formula to measure individual pair differences and resemblances, Shen has this to say: (177)

"Though apparently adaptable from the product-moment formula, the coefficient is none the less an unfortunate vitiating of the Pearson concept. A correlation coefficient is a measure of the accuracy of estimating the positions of the individuals of a population in one variable, when their positions are known in another, always with reference to the mean and the standard deviation of the group. When it comes down to a population of *one*, the essential conditions have evaporated and the correlation no longer has meaning."

Shen adds that, "The use of this measure, however, does not at all invalidate the conclusion that there are two distinct types of twins." (p. 602)

degree of resemblance for each twin pair in his collection. His results are summarized in the following table:

TABLE 10

DISTRIBUTION OF MENTAL RESEMBLANCE IN INDIVIDUAL PAIRS OF TWINS AS

$$\text{MEASURED BY: } r = 1 - \frac{D^2}{2\sigma^2} *$$

$r$	All Twin I.Q.	Like Sex I.Q.	Unlike Sex I.Q.
Less than $-.91$ .....	2		2
$-.90$ to $-.81$ .....	0		
$-.80$ to $-.71$ .....	0		
$-.70$ to $-.61$ .....	0		
$-.60$ to $-.51$ .....	0		
$-.50$ to $-.41$ .....	0		
$-.40$ to $-.31$ .....	1		1
$-.30$ to $-.21$ .....	0		
$-.20$ to $-.11$ .....	1	1	
$-.10$ to $+.01$ .....	0		
$0$ to $+.09$ .....	2	1	1
$+.10$ to $+.19$ .....	0		
$+.20$ to $+.29$ .....	2	2	
$+.30$ to $+.39$ .....	0		
$+.40$ to $+.49$ .....	2	2	
$+.50$ to $+.59$ .....	6	1	5
$+.60$ to $+.69$ .....	7	3	4
$+.70$ to $+.79$ .....	8	4	4
$+.80$ to $+.89$ .....	12	8	4
$+.90$ to $1.00$ .....	62	45	17
Total.....	105	67	38

\* From Merriman, 121, p. 41.

To show the differences of the two groups, like and unlike-sex, in ability to produce pairs of almost perfect duplication, Merriman rearranged his data to show the distribution of all those cases

TABLE 11

DISTRIBUTION OF RESEMBLANCE IN INDIVIDUAL PAIRS TAKEN FROM DATA IN TABLE 10 SHOWING  $r$ 'S FOR THOSE CASES FALLING WITHIN  $.91$  TO  $1.0$  \*

$r$	All Twin Pairs I.Q.	Like Sex I.Q.	Unlike Sex I.Q.
$.90$ .....			
$.91$ .....			
$.92$ .....	9	6	3
$.93$ .....			
$.94$ .....			
$.95$ .....	9	7	2
$.96$ .....			
$.97$ .....	10	7	3
$.98$ .....	9	5	4
$.99$ .....	10	6	4
$1.00$ .....	15	14	1
Total.....	62	45	17

\* From Merriman, 121, p. 41.



which obtained correlations of .90 or over. It will be noted in his table that the incidence is much heavier for the like-sex than for the unlike-sex, and that of the fifteen pairs who obtained a coefficient of 1.00 (perfect resemblance), only one of these was a case of unlike-sex pairing.

Merriman's conclusion from Table 11 is:

"If we accept the range of .99 to 1.00 as amounting to practical identity, we find that twenty out of forty-five pairs of like-sex twins are practically identical, while five out of seventeen unlike-sex pairs can be so regarded." (p. 40)

Closely following Merriman's was a study on twin resemblance published in 1925 by Lauterbach (112), and reviewed by Fisher (54). Lauterbach, too, was concerned with finding out differences, if any, between older and younger twins, like-sex and unlike-sex twins, resemblances in native traits *versus* resemblances in acquired traits, and certain other points related to twinning. Fisher worked up some of the Lauterbach data with a view to examining Thorndike's contentions that there were not two distinct classes of twins, and that there was "specialization of resemblance."

To measure intelligence Lauterbach used the Terman Group Test of Mental Ability on 113 pairs of twins, and the National Intelligence Test on ninety-seven pairs. To measure traits much subject to training he made use of several educational tests: Thorndike-McCall Reading, Courtis Arithmetic, and various minor tests of mental processes. For Subjects, he secured all the twins obtainable from the schools of seventeen cities in Southern Wisconsin, comprising seventy-one male pairs, seventy-eight female pairs, and sixty-three mixed pairs.

Lauterbach, also employing the Pearson correlation coefficient, pointed out difficulties of applying this formula to identical twin data, in that it was impossible to determine the axis on which each member of a like-sex pair should be placed in a correlation plotting. In order to obviate the difficulty, Lauterbach entered his data twice for like-sexed pairs; for mixed sex he adhered to the usual single entry method of plotting.\* He also studied his twin data by calcu-

\* Lauterbach (112) writes:

"Ordinarily the correlation is figured between different traits in the same individuals. It is customary to figure the correlation, for example, between ability in mathematics and language for any particular group, pairing the scores. But in the case of twins it is desired to know the correlation between the abilities of the pair, in mathematics or in language, pairing the individuals. As a consequence, there is no principle to determine the axis upon which a particular member of a twin pair shall be placed. If numbers are drawn in pairs by chance

lating average differences for different groups, divided according to age.

Like Merriman, Lauterbach failed to take into account the variability of his compared groups, which, as stated before, is a function of the coefficient derived and partly responsible for its size.

Older *versus* Younger Twins

Lauterbach's conclusion in regard to the degree of likeness between older and younger twins was that older twins showed no greater resemblance than younger ones. He notes that:

"... even in traits most subject to training there are no large differences. One might expect greater similarities in reading, arithmetic, and writing, abilities subject to training, but such similarities do not materialize except in reading." (p. 555)

His tabulated data are set down below:

TABLE 12  
COEFFICIENTS OF RESEMBLANCE OF OLDER VERSUS YOUNGER TWINS \*

Trait	90-156 Months	157-238 Months	Difference
I.Q.'s (Group tests) .....	.64	.73	+.09
Reading quotients .....	.44	.57	+.13
Arithmetic accuracy .....	.59	.50	-.09
Arithmetic speed .....	.59	.57	-.02
Memory for digits .....	.36	.34	-.02
Handwriting quality .....	.49	.58	+.09
Handwriting speed .....	.66	.55	-.11
Average .....	.54	.55	+.01

\* From Lauterbach, 112, p. 555.

Reviewing the measures obtained by his predecessors on this same point (resemblance of older and younger twins) we may now compare them with Lauterbach's data:

TABLE 13  
CORRELATIONS OBTAINED BY SEVERAL INVESTIGATORS ON TWIN RESEMBLANCE

Investigator	Younger Twins		Older Twins	
	Age	r	Age	r
Thorndike .....	(9-11)	.83	(12-14)	.70
Merriman .....	(5-9)	.80	(10-16)	.75
Lauterbach .....	(90-156 mos.)		(157-238 mos.)	
I.Q. ....		.64		.73
Reading Quotient .....		.44		.57

and the smaller is always placed on the axis, and the larger on the other, a spurious correlation results. To avoid such an effect each twin was entered twice in the scattergram, once on each axis." (p. 527)

*Like-sex versus Unlike-sex*

Lauterbach also found that like-sex twins showed a greater resemblance than unlike-sex pairs. He conceded that sex may vary the environment, and if so, for the older twins, the environmental variance would, therefore, be greater, but he believed that the true cause for difference between the two types—like and unlike-sex—existed by virtue of original nature, “since environments which seem to be similar, have little influence in modifying the relationships.”

## Criticism of Lauterbach's Work

The same criticism which Shen pointed out in regard to Merriam's treatment of his data may be applied to Lauterbach's analysis; namely, that since he did not allow for the variabilities of his different groups in obtaining his correlation coefficients, a certain part of these values is to be attributed to factors other than the variables in question, such as: Age, learned *versus* acquired trait, *etc.*

## Fisher's Interpretations of Lauterbach's Data on Twin Types and “Specialization of Resemblance”

Some of Lauterbach's data were reworked by Fisher (54), who was especially interested in the question of heterogeneity and homogeneity of the twin group. Because twins of like sex show greater similarity than those of unlike sex, Lauterbach had concluded the existence of two classes, of which fifty-nine per cent at least comprised identical twins.

TABLE 14

COEFFICIENTS OF RESEMBLANCE OF TWINS IN VARIOUS TRAITS \*

Physical Traits	Like-sex	Unlike-sex	Younger	Older
Height standing .....	.80	.53	.61	.65
Height sitting .....	.73	.59	.60	.58
Weight .....	.89	.50	.59	.64
Cephalic index .....	.67	.59	.72	.61
Average .....	.78	.55	.63	.62

\* From Lauterbach, 112, p. 565.

Fisher estimates that the correspondence between identical twins on this supposition must be at least about .90. He reworked certain of the physical measurements obtained by Lauterbach—height and cephalic index—(see Table 14) and from these measurements concluded the presence of both fraternal and identical groups in the whole. He also investigated the question which Thorndike



raised of "specialization of resemblance," that is, that twins, strikingly similar in one or more traits, may be quite dissimilar in others. Fisher says:

"If we set aside twins with large differences in stature as certainly fraternal, the remainder show that those with large differences in cephalic index have on the average larger differences in stature; *mutatis mutandis*, the same is true of cephalic index. The data thus supply, for the first time, evidence of association of resemblance in different traits." (p. 578)

Averill and Muller (5), in a minor study, in 1925, also reported measurements on physical and mental resemblance of ten pairs of twins. However, their data—including records on disease and development, temperament, scores on mental tests, and achievement in school—were not systematically analyzed or interpreted.

In 1927 and 1928, Koch (108, 125) placed on record detailed measurements showing certain resemblances and differences in conjoined Siamese twins. This same pair of girls was later reported upon in 1932 by Carter (22), and by Seeman and Saudek (176). The latter were particularly interested in handwriting.

As part of the contribution to the nature-nurture evidence, gathered for the "*Twenty-Seventh Year Book*" of the National Society for the Study of Education, Tallman (125) reported her findings on 158 pairs of twins and about 200 ordinary siblings, all of whom were tested by the Stanford-Binet. Sixty-three pairs were classified as identical twins because they were noted by the examiner as "looking so much alike that it was all but impossible to tell them apart," while thirty-nine pairs were described as "obviously different in appearance."

Tallman's results, arranged in various sibling and twin groupings, are set down in the following table:

TABLE 15

AVERAGE I.Q. DIFFERENCES OF SIBLING AND TWIN GROUPS ON STANFORD-BINET \*

Group	N	Average Difference	P.E.
All siblings (1 to 4 years apart)....	199	13.14	.709
Sibs less than 2 years apart.....	128	11.96	.963
All twins (plus Merriman's) .....	263	7.07	.265
Unlike sex .....	84	8.48	.517
Like sex .....	178	6.42	.299
Identical twins .....	63	5.08	.469
Non-identical .....	39	7.37	.624
Identical boys .....	34	5.82	.766
Identical girls .....	29	4.22	.434

\* From Tallman data.

She concludes:

"The results of the work are, then, by intelligence quotient ratings, twins are about twice as much alike as are siblings; that boy-girl twins, known to be non-identical, resemble the siblings' results more than does any other twin combination, whereas, of the like-sex twins, those which look much alike test more nearly alike than those which look distinctly different." (p. 86)

Wingfield (218, 219) in 1928, and later Wingfield and Sandiford (220) report a fairly extensive study of 102 pairs of twins selected at random from the public schools of Toronto and Hamilton, Ontario. These data are compared with some secured by the same techniques on twenty-nine orphans in a fraternal residential orphanage near Hamilton. Identical twins are those "agreed upon unanimously by the examiners and the teachers in the school; all others were fraternal." Wingfield attempted to correct certain unreliabilities of earlier studies by more caution in the use of statistics and by using a combination of several well calibrated tests for intelligence and achievement. For intelligence, he combined I.Q.'s from several group tests: National Intelligence, Scale A, Form 1, and McCall Multi-mental Scale. Educational achievement was measured by Stanford-Achievement battery, the B.C. Test in Fundamentals of Arithmetic, and the Morrison-McCall Spelling Scale. Wingfield avoided the difficulty of selection of axes in plotting twin data\* and was careful to allow for flaws which are apt to creep into comparisons by the correlation method. He eliminated the effect of age on his raw correlations by calculating the correlation between age and I. Q. The correlation and the variability of the groups were both taken into account by the use of the standard error of estimate,  $\sigma \sqrt{1 - r^2}$ , the smaller the standard error of estimate, the greater the resemblance.

Resemblances between the two types of twins were compared with resemblances of unrelated orphanage children. Wingfield was anxious to contrast his studies of twins of "similar inheritance," with orphanage children of "dissimilar inheritance but similar environment." The number in the orphan group was small, and the assumption of uniformity of environment in this case is open to question. Wingfield also assembled data from other studies and

\* Wingfield used the Otis formula:  $r = 1 - \frac{1}{2} \left( \frac{\sigma d}{\sigma y} \right)^2$  "where  $\sigma d$  is the standard deviation of the differences between the scores of each twin pair for the trait measured, and  $\sigma y$  is the standard deviation of the scores of all children in general for the same trait."

compared them with his own findings. He analyzed his twin data in much the same way as did his predecessors, by comparing younger and older twins, and by comparing resemblances in traits little and much subject to training ("native" *versus* "acquired" traits).

### Older *versus* Younger

Wingfield's data on resemblance of younger *versus* older twins may be studied in the following table:

TABLE 16

COMPARISON OF OLDER TWINS WITH YOUNGER TWINS IN RESEMBLANCE \*

Trait	N	Raw r	Twins 8 to 11 Years	Standard Error of Estimate
			r Cons't for Age	
General Intelligence . . . . .	45 prs.	.73	.71 $\pm$ .047	8.09
Twins 12 to 15 Years				
General Intelligence . . . . .	50 prs.	.78	.77 $\pm$ .038	9.16
Difference of coefficients is .06				
P.E. of difference of 2 coefficients is .06				

\* Data from Wingfield, 220, p. 417.

Wingfield notes that his results for intelligence are conflicting, the "standard error" favoring the younger, the coefficient of correlation, the older. The P.E. of the difference is equal to the difference, which means that there is a one to one chance that the difference found between the coefficients for the I.Q.'s of younger and older twins is entirely accidental.

If environment were the potent factor, the older twins would be the more alike; hence, he concludes that environment cannot account for the intellectual resemblance of twins.

TABLE 17

RESEMBLANCE OF ALL TWIN PAIRS IN "NATIVE" AND "ACQUIRED" TRAITS \*

1. E.Q.'s (Stanford Achievement) . . . . .	r is .76 $\pm$ .029	(94 pairs)
I.Q.'s (General Intelligence) . . . . .	r is .75 $\pm$ .029	(102 pairs)
Difference . . . . .	is .01 $\pm$ .041	
2. A.Q.'s (Stanford Achievement) . . . . .	r is .83 $\pm$ .021	(94 pairs)
I.Q.'s (General Intelligence) . . . . .	r is .75 $\pm$ .029	(102 pairs)
Difference . . . . .	is .08 $\pm$ .036	
3. Arithmetic scores . . . . .	r is .78 $\pm$ .028	(88 pairs)
I.Q.'s (General Intelligence) . . . . .	r is .75 $\pm$ .029	(102 pairs)
Difference . . . . .	is .03 $\pm$ .040	
4. Spelling scores . . . . .	r is .85 $\pm$ .019	(92 pairs)
I.Q.'s (General Intelligence) . . . . .	r is .75 $\pm$ .029	(102 pairs)
Difference . . . . .	is .10 $\pm$ .035	

\* From Wingfield, 220, p. 418.



"Native" *versus* "Acquired" Traits

Wingfield's findings on twin resemblance in "native" *versus* "acquired" traits may be studied from Table 17. Noting that the differences are small and insignificant, Wingfield adds:

"We may therefore conclude that twins are no more alike in those traits much subject to training (reading, arithmetic, spelling, literature, nature study, and history) than they are in general intelligence, a trait that is supposedly not directly affected by schooling." (p. 418)

Wingfield's analysis of the resemblances between different groupings of twins is to be found in the following table:

TABLE 18  
COEFFICIENTS OF RESEMBLANCE OF TWINS IN GENERAL INTELLIGENCE \*

Group	No. of Pairs	Raw r	r Const. for Age	Standard Deviation $\sigma$	Stand. Error $(\sigma\sqrt{1-r^2})$	Mean Difference in I.Q.'s
All twin prs. ....	102	.76	$.75 \pm .029$	13.5	8.92	9.65
Unlike sex prs. ....	26	.62	$.59 \pm .086$	12.9	10.40	12.00
Like sex prs. ....	76	.83	$.82 \pm .025$	13.6	7.79	8.50
Fraternal prs. ....	57	.72	$.70 \pm .045$	12.65	9.03	11.74
Identical prs. ....	45	.91	$.90 \pm .019$	14.3	6.23	6.23

\* From Wingfield, 220, p. 92.

In 1929 Davis (34) presented some notes on orphan twins, arguing that an orphanage offers greater assurance of identity of environment than does the ordinary home; and that if environment is such a powerful molding force, orphanage twins should tend to show greater similarities than children not living in an institution. He compares the resemblance of twenty-three pairs of orphan twins, living on the average four years in an institution, having entered on the average at eight years of age, with twin resemblance in general as reported by other investigators. He offers no criterion for determining similarity or dissimilarity of his twins and dismisses the matter by saying: "It will be noted from the table that fourteen of the sets are fraternal and nine sets non-fraternal." \* (p. 30)

In the following table Davis indicates that institutional residence is not any more potent than life in private homes to make twins resemble each other mentally:

\* The present writer has not been able to note this point from the data submitted, but has noted a confusion in Davis' mind between the terms "fraternal" and "identical" with an apparent interchange of connotation.

TABLE 19

SOME MEASURES OF A GROUP OF TWINS LIVING IN AN ORPHANAGE \*

No. Pairs	r I.Q.'s	Med. Age at Entrance	Period in Institution	Mean Diff. Fraternalst	Mean Diff. "Non- fraternal"
23	.77 $\pm$ .057	8	4 yrs. (avg.)	8.25	9.55

\* Data from Davis, 34.

† Identical (?)

Davis also found but slight variations in resemblance between twins who entered the institution at different ages. His study is a minor one, and not carefully executed or reported; hence no great weight can be attached to it.

In 1929 Holzinger (92), Freeman (57), and Newman (133) reported in separate articles on the same group of twins. Holzinger's chief interest was to discuss and present methods of measuring twin resemblance; Newman's to offer means of diagnosing ovular type; while Freeman, less generously, has submitted merely an abstract of a paper, presented in greater detail to the American Psychological Association in 1929. One looks forward to future reports from this effective and promising collaboration of three: a statistician, a biologist, and a psychologist.

This Chicago group of workers studied fifty pairs of identical twins, of an average age of 13.4 years, and compared their findings with data on fifty-two pairs of like-sexed fraternal twins, of an average age of 13.5 years. In the Chicago studies the Stanford-Binet mental age was used as a measure of mental ability, and the Stanford Achievement educational age as a measure of educational achievement. To measure genetic resemblance, correlation coefficients were used. To measure the relative importance of the effect of nature and nurture on mean differences of the two groups, certain new formulae were presented. A formula was also given to measure the relative importance of nature and nurture in determining the variability of twin differences. The use of these formulae were illustrated by application to physical and mental measurements, palm prints, records of physical likeness and differences, scholastic ability, social interest data, *etc.*

Some of Holzinger's tables, from which conclusions were drawn are set down on our pages 202 and 203.\*

A theoretical value "T" has been offered in a formula developed in detail by Holzinger as approximate measure of the ratio between nature and nurture in determining twin differences. When this

\* For detailed formula, consult Holzinger's article (92).

TABLE 20

MEAN DIFFERENCES BETWEEN PAIR MEASURES \*

Variable	Identical		All	Fraternal		All
	Younger	Older		Younger	Older	
Finger ridges (both) .....	3.2	3.6	3.4	21.7	22.9	22.4
Cephalic index .....			.02			.03
Height .....	1.7	1.6	1.7	4.4	4.4	4.4
Mental Age .....	7.2	9.8	8.4	10.6	19.9	15.9
Educational Age .....	5.5	7.5	6.5	6.5	15.1	11.6
Motor .....			19.0			29.0
Woodworth-Mathews (test of emotional stability) .....			5.6			6.8

\* From Holzinger, 92, p. 245.

formula for "T" was applied to the twin data gathered in Chicago, the following values were found for each of several traits:

TABLE 21

ESTIMATED EFFECT OF NATURE RELATIVE TO NURTURE IN PRODUCING AVERAGE TWIN DIFFERENCES \*

Variable	Younger	Older	All
Finger ridges (both) .....	5.8	5.4	5.6
Cephalic index .....			.7
Height .....	1.6	1.7	1.7
Mental Age .....	.5	1.0	.9
Educational Age .....	.2	1.0	.8
Motor .....			.5
Woodworth-Mathews (test of emotional stability) .....			.2

\* From Holzinger, 92, p. 245.

(The table should be understood as follows: For finger ridges (all twins), nature is in the proportion 5.6 for one of nurture. For mental age, nature is in the proportion .9 for one of nurture.)

If the reader will bear in mind that identical twins differ "by nature" to an extent comparable to differences between right and left halves of the normal body (see pp. 177 f) he will readily see that dissimilarity, where it exists, in such characteristics as finger ridges, does not *per se* result from nurture alone. Hence the figures in Holzinger's table would reflect less credit for nature than it is actually entitled to. In spite of such allowances, Holzinger's figures are at times startling, *e.g.*, that for cephalic index. For a criticism of the statistical weakness of Holzinger's formulae, the reader is referred to Kelley (102).

However, since it is not so effective to study factors which make for *average* differences between two groups, as it is to study factors at work in producing a *spread* of individual intra-pair differences within any one group, a second formula "T<sub>2</sub>" was applied.

Holzinger's (92) investigation of the *variability* of twin differ-



ences results in the following data ("T<sub>2</sub>" showing the effectiveness of nature over nurture):

TABLE 22

RELATIVE EFFECT OF NATURE AND NURTURE ON VARIABILITY OF TWIN DIFFERENCES \*

Correlations and values of T<sub>2</sub>—All r's corrected for age

Variable	Identical	Fraternal	T <sub>2</sub>	P.E. of T <sub>2</sub>
Standing height .....	.93	.65	4.0	1.2
Weight .....	.92	.63	3.6	1.1
Head length .....	.91	.58	3.7	1.1
Binet M.A. ....	.86	.60	1.9	0.7
Binet I.Q. ....	.88	.63	2.0	0.7
Educ. Age .....	.89	.70	1.7	0.7
Woodworth-Mathews .....	.56	.37	0.4	0.3
Motor .....	.69	.38	1.0	0.4

\* From Holzinger, 92, p. 247.

Holzinger comments (92):

"It will be noted that nature is much more effective than nurture for physical traits. In the case of mental age, I.Q., and word meaning, the value of T<sub>2</sub> is approximately 2.00, with a disconcertingly large probable error. There is some evidence from the regularity of these values, however, that *nature* is somewhat more effective than *nurture* in the determination of difference variability for mental traits." (p. 247f)

Freeman (57), whose brief report is obviously based on the same group of twins, concludes: (1) That identical twins are much more alike than fraternal; and (2) that some of the traits are much more subject to environmental influence than others. Holzinger (92) sums up his findings as follows:

"1. For intelligence, nature is about equally effective with nurture in producing mean twin differences, but nature is somewhat more effective than nurture in determining variability of such differences. Nurture influences would thus seem to play a large part in the modification of intellect.

"2. In case of scholastic achievement, the relative influence of nature and nurture probably changes with the trait. On the whole nature would appear little, if any, more effective than nurture." (p. 248)

In 1930 Baldwin and Ewert (11) reported studies on the mental and motor activities of three pairs of identical twins. They concluded:

"The performances of twin subjects in motor and intelligence tests were found to be more similar than it was for non-twin subjects. Twins were found to vary more in their individual performance in the tap-

ping and card-sorting tests than with the performance of their twin mates. If our results are typical for identical twins in general, they strongly suggest that certain motor tests, such as tapping and card-sorting, are valuable tests for twin identification." (p. 465)

Bakwin (9), also in 1930, by applying a wide range of different tests, tried to determine wherein identical twins tend to be similar, and in which traits they tend to show differences.

Anthropometric and mental ability measurements were surprisingly similar; scores on educational and temperamental tests, less so. For twins the composite rating intelligence quotient was identical except in one case; the Stanford-Binet I.Q. was identical except in one case, which showed an intra-pair difference of twelve points; Pintner-Paterson I.Q.'s were similar in nine out of eleven cases; Healy Pictorial Completion II scores corresponded except in one case; on the non-language test six of the seven cases obtained identical scores; on Porteus Maze and Healy II (B?) there was more variation.

Younger children secured almost identical scores on the Kuhlmann-Binet and the Merrill-Palmer mental tests, and were equally close on language. In school tests there was more intra-pair difference variability than in mental test abilities; vocabulary scores were very close; nine of the twelve had similar scores in drawing (four pairs of drawings being almost identical); spelling and reading varied more than arithmetic.

Temperament tests revealed marked similarity in Downey profiles and Woodworth-Mathews scores, although in overt behavior there was marked difference.

A detailed report on psychological measurements of a set of triplet girls (21), and an even more intensive study of quadruplets girls by Brintle (18), have been placed on record in the journals. The quadruplets are the same mentioned earlier by Popenoe (160), of whom two were so much alike as to be interchangeable, the third very much like the first two, and the fourth quite noticeably different—in appearance, mental ability, and personality. There was a similar decided difference in this child's score on the intelligence and educational tests. Stanford-Binet ratings are given below for the four girls:

		Roberta	Mona	Leota	Mary
S-B	M.A. ....	14-5	13-11	14-1	12-11
	I.Q. ....	112	108	110	98

The author concludes that these girls are probably derived from three eggs, that Roberta and Mona are identical, and the other two

fraternal. There are no striking differences between the two identical twins as a result of random environmental differences. The author remarks:

"From a study of a set of quadruplets in which we have both a set of identical twins and a set of fraternal twins who were reared under the same environmental conditions, it appears that random environmental influences have had very little or no effect in causing the identical twins to grow more unlike. Furthermore, it does not seem that the fraternal twins have become more like the identicals, but rather that factors of heredity have been most influential." (p. 111)

A preliminary report on a set of identical quadruplets, still in their infancy, is also on record (28). It is most fortunate that these babies have come so early under scientific observation. Their subsequent development will be watched with real interest by students of mental heredity.

Recently also two records (29, 167) have appeared on four sets of triplets who are considered in each case to be identical. Apparently then, the impregnated ovum is capable of a tri-partite as well as of a dual division.

In 1930 appeared Hirsch's (86) little book in which he reviews much of the earlier literature on twins, recasts some of the old arguments, offers some new case data on intelligence and educational achievement, and draws rather sweeping conclusions. Hirsch gives recent and interesting data on four age groups of twins, who took intelligence tests appropriate to their ages, the children from seven to ten taking the Otis primary and the Dearborn A mental tests, while those aged ten to eighteen took the Otis or Terman tests and Dearborn C. Older and younger subjects were studied by personal estimates. Those over eighteen also took Dearborn C and D mental tests. Other information on personality, on manual, motor, and educational activities, and anthropometric measurements are also supplied in detail, so that it is possible for interested readers to rework the material from their own point of view.

Hirsch has analyzed his data from much the same standpoint as earlier workers, namely, by offsetting average intra-pair differences of identical twins with the same on fraternal twins. He contrasts this net difference with the average intra-pair differences of identical twins reared together with the same on identical twins reared apart. If identical twins responding to dissimilar environments are more alike than fraternal twins in a similar environment, then Hirsch finds in this ratio a measure of the significance of hereditary factors. He illustrates his argument as follows:



If (1) we suppose that the average intra-pair difference for similar twins is two points I.Q.; and (2) the average intra-pair difference for dissimilar twins is twelve points I.Q.; and if we concede that the difference in (1) is determined by environment for similar twins, then this amount should be credited to environment for determining differences for dissimilar twins. But if in (2) we find a difference of twelve points, or ten points more than the two points, we can say that 12 minus 2, or 10, is the amount due to heredity, or five times that due to environment. (p. 9)

This argument reflects Holzinger's (92) approach, but lacks Holzinger's statistical precision and caution.

In his zeal to secure cases of identical twins responding to different environment, Hirsch lists not only those reported by Müller, Newman, *etc.*, but includes five of his own gathering, whose ages at the time of separation were nine, thirteen, eighteen, twenty-two, and twenty-five; ages all a little too late in the developmental process for pronounced differential effects.\* However, for what interest they might hold, the facts are set down below:

TABLE 23  
SIMILAR TWINS LIVING APART \*

Pr.	Sex	Source of Data	Age of Separation	Age at Test	Name of Test of Intelligence	I.Q. Twins 1 and 2		Difference
1	F	Hirsch	13	18-5	(Dearborn C) (Terman Group)	98	94	4
2	F	do	9	12-7	(Dearborn C) (Terman Group) (Otis)	95	89	6
						84	88	4
3	F	do	22	33	(Dearborn C) (Terman Group)	129½	128½	1
4	F	do	18	29	(Dearborn C) (Terman Group)	107	103	4
						94	92	2
5	F	do	25	28	Grad. Mt. Holyoke at age 23			

\* Data from Hirsch, 86.

Assuming validity for his method of measuring the relative contributions of heredity and environment, Hirsch concludes that both contribute to mental and anthropomorphic qualities in unequal degrees and in relation to specific or general traits. We summarize: In determining I.Q. differences between twins, heredity is about five times as significant as environment. In determining weight differences between twins, heredity is only two times as significant.

\*It is interesting to note in this connection that Carter (21) is gathering data on adult twins who have been separated after reaching maturity.

In determining emotional and impulsive processes, heredity is probably two to five times as significant (but this study did not get quantitative measurements; the statement is based on positive correlations with intelligence and what scientists know).

Education and training vary in influence in proportion to the hereditary type dealt with. Environment becomes more important as we ascend the human scale. Environment becomes more important as heredity becomes higher and more competent. (p. 148)

These conclusions are very interesting, but are subject to the limitations inherent in Hirsch's method. His main objective, namely, that it is possible to find cogent quantitative evidence to show that a large proportion of twins are almost exactly alike, and that another large group of twins are as dissimilar as ordinary siblings, has been adequately established. But the very nature of his method of selecting cases, especially identical twins who were selected *because they were similar mentally as well as physically*, disqualifies any deductions as to amounts of differences which obtain between identical and fraternal groups as a whole. While his double basis of selection may be justified to insure monozygosity for his group, it can scarcely be endorsed as a method of selecting twin material for purposes of contrasting identical with fraternal pairs in mental resemblance!

In 1929 Gesell and Thompson (74), and later Strayer (190) in 1931, published detailed observations on a pair of identical twin girls, with reference to the relative effects of maturation *versus* training at early developmental levels. A new contribution in technique was made with these studies, in that one twin was used as an experimental Subject, who took the training (in stair-climbing, and tower building, manipulating cubes, and speech development) while her co-twin was used as a "control." The identity of the identical twins was assured by use of the Yale developmental schedules, regular two-weekly examinations having been made since birth. From age forty-six to fifty-two weeks, Twin T was intensively trained to climb a staircase and also to gain coördination in manipulating small wooden cubes as in tower-building. During this period, her co-twin C, was not permitted to get this experience, but at a later age (fifty-three to fifty-five weeks) was trained as a check to determine the trainability of her sister (or virtually the same person) at a later age.

Similar experimental procedure was applied to the same Subjects at the age of eighty-four weeks by Strayer (190), who wished to analyze the influence of training in vocabulary building in rela-

tion to maturity. Both children, at eighty-four weeks, had equal pre-conversational readiness to learn speech; neither knew any other word than "up." Twin T was given five weeks intensive practice in speech, while her co-twin, C, was kept in a strictly non-verbal environment. At the age of eighty-nine to ninety-two weeks, Twin C was trained by the same procedure, and using the same words, while T remained in a normal language environment. The relative speech ability of the two girls at different age levels of learning was compared.

The result, which consistently forced itself upon the observation of the workers in the Yale laboratory, was that training did not materially alter the developmental behavior pattern set by nature in both girls. Exercise and practice and intensive drill were apparently powerless to change the time of appearance or quality of reaction of such mental and motor activities as stair-climbing, tower building, and acquiring a vocabulary. Progressive increments of growth in function were almost identical in the trained and untrained Subject, a developmental process which could not have arisen as a result of conditioning factors in the environment, since these factors were different for both girls. Learning at these early age levels seems to be conditioned more by the factor of growth and maturation of structure than by training. "Maturation sequence" which is genetically pre-determined is more significant than training. Gesell comments that the extreme behaviorists who see in the "Conditioned Reflex" the final explanation of growth and learning, "do not give due recognition to the inner checks which set bounds to the area of conditioning."

The co-twin control technique, when more extensively developed and applied to group studies, may be expected to yield most valuable results. The suggestion of using groups of identical twins has already been proffered by Blakeslee (16).

Another study on maturation, reported by Hirsch (86) but undertaken by Page (142), finds in the tendency of identical twins to maintain parallel growth over a period of years, an indication of what is pre-determined at birth. If this tendency for identicals and fraternal twins is contrasted, an index is obtained as to the strength of the "factor of birth," since both sets have similar environments. This is virtually the same argument outlined earlier, but here it is the *combined growth process* over a period of years which has come under scientific observation. It is to be hoped that Page's group of twins (part of the larger Harvard Growth Study) will not be lost sight of as the years go on.



## IDENTICAL TWINS REARED APART

Of the greatest interest to the student of heredity, however, will doubtless be those case reports of Müller (122), which appeared in 1925, and of Newman (133, 138), in 1929, 1932, and 1933. These workers have to date (1933) presented measurements of physical, intellectual and emotional traits of ten sets of identical adult twins reared apart since infancy. Because of their almost unique importance, these reports (especially on intellectual resemblance) are given in fuller detail:

## 1. "B" and "J":

The first indication of the value of identical twins reared apart, as significant material to the student of heredity, was submitted by Popenoe (159) in 1922. This writer presented a very sketchy account of twin girls separated since early infancy, with practically no subsequent inter-communication, until their nineteenth year, when they began to correspond with each other by mail. These girls were very much alike in height, hair-color and texture, in voice, and even their clothing could be readily interchanged. They were both high-strung women; both reported previous illness which had occurred about the same time. Intellectually, they seemed alike, saying that they "learned rapidly, but too smatteringly"; both had administrative ability, having held offices in various clubs, and the like. One girl was married, the other single; although both had been engaged at about the same time. The most interesting element in this almost complete similarity of development, is that one had completed high school and become a teacher, whereas the other had not gone beyond the fifth grade in elementary school, after which she had trained in secretarial work. Popenoe comments:

"When two individuals are separated in infancy, brought up as differently as are the twin sisters described above, and still manifest such mental similarities, it is impossible to resist the conclusion that the physical make-up of the individual is very largely settled by the time he is born." (p. 144)

Although Popenoe did not report detailed objective measurements of resemblance, especially of intellectual resemblance, his article had the effect of leading another investigator to study these same twins, much more intensively, and with standardized tests. Our reviews will deal largely with resemblance in test intelligence.

In 1925 Müller (122) added more information on the general

likeness of these twins to each other. Both seemed characterized by similar degrees of energy, even tension, showing a tendency to overdo to break-down point; both were alert and interested in practical problems, popular with friends, personally attractive, and shared the same tastes and attitudes in books and toward recreational and social situations. Müller's chief contribution, however, is the result of administering psychological tests, which are superior to the older method of rating by personal opinion. He gave both intelligence and personality tests, but here we are concerned, for the moment, only with the results of the intelligence tests, which revealed practically identical scores for both girls, as the following summary will show:

TABLE 24  
MENTAL TEST DATA ON "B" AND "J"

Twin	Test	Raw Score *
B .....	Army Alpha Test	156
J .....	do	153
	Difference	3 (Insignificant)
B .....	Otis Advanced Intelligence Test	64
J .....	do	62
	Difference	2 (Insignificant)

\* The reader is cautioned against confusing the raw score of Alpha test with the I.Q.'s reported for the next nine cases. Müller does not report I.Q.'s for "B" and "J," since he did not administer the Stanford-Binet. Binet I.Q.'s, derived from the Alpha scores of "B" and "J," would be about the same.

These twins had been separated at the age of two weeks, re-united at the age of eighteen, and had lived in different places after their reunion until the time of examination, at age of thirty-two. "B" has been adopted by people who were engaged in a mining and hauling business, and who had often changed their homes, living most of the time an outdoor life. As a child, "B" had been given doses of laudanum which resulted in a stomach disorder. She had also had measles, mumps, chicken pox, typhoid and pneumonia. Her four years in school were topped off by a clerical course; her work later took her into war service. She was unmarried.

"J", the teacher, was a graduate of high school, with some summer university courses to her credit. She had been brought up on a ranch, and later her parents had kept a roadhouse. She was married and the mother of one child. As a child she had had measles, mumps, and scarlatina. Both girls suffered from backache, due to a congenital short Achilles tendon. Both had contracted tuberculosis when about eighteen, and both had had mild "nervous breakdowns" a little later.

## 2. "A" and "O":

Four years after Müller's (122) publication, Newman began to issue reports on a series of identical twins who had been reared apart. The first were twin girls, "A" and "O", separated at the age of eighteen months, reunited at about eighteen years and studied by Newman a year or so later. Twin "A" had been adopted by a family in which there were several children and brought up in a crowded middle class urban district in London, England. She had suffered from deprivation and malnutrition during the war. At birth she had been very weak; later, at five years, had contracted scarlet fever; at seven, measles and whooping cough; and had suffered chronically from tonsillitis and bronchitis, and occasional rheumatism. "O" was brought early to Canada, an only child in a family of better social standing than that in which her sister had been placed. She grew up in a small town in Ontario, which afforded a distinct contrast to her sister's crowded environment. "O" had contracted measles at seven, diphtheria at nine or ten, chicken pox at eight; and had also suffered from chronic tonsillitis, bronchitis, and rheumatism. Both girls were interested in church activities, and did not care particularly for the company of the opposite sex. Both had had approximately the same amount of schooling, nine years general, and later a secretarial course, which qualified them for the same occupation of stenography. In a later note, Newman qualifies this report by recording a difference in educational background between these twins in that "A's" course was much interrupted by the war and was of a domestic science training, while "O" took academic work comparable to that in best American institutions.

Results of psychological tests are summarized in Table 25.

In interpreting the results of these American tests, standardized on American children of normal American environment, especially tests of educational achievement, some cognizance must be taken of "A's" English background. This factor might be of considerable importance with reference to those elements which have local emphasis, questions of history, geography and the like. Difference between English and Canadian education would not, however, be expected to have much influence on intelligence test results. It would have been interesting to have given tests, standardized on English children, using English subject matter, to see whether the relative position of the two girls would have been the same, or whether the differences in scores would have been as wide.



TABLE 25  
MENTAL TEST DATA ON TWINS "A" AND "O"

Test (Educational)		Twin "A"	Twin "O"	Difference
Stanford-Achievement . . . .	Reading Age	16-8	18-4	
	Arithmetic Age	11-11	14-9	
	Spelling Age	18-1	18-6	
	Educ. Age	15-1	16-8	1 yr. 7 mos.
Test (Intelligence)		Twin "A"	Twin "O"	
Stanford-Binet . . . . .	Score in Terms of:			
	I.Q.	84.9	96.9	12 points I.Q.
International Group * . . . .	M.A.	13-7	15-6	1 yr. 11 mos.
	Raw Score	111	173	62 points
Thurstone Psych. Exam. . .	Rank	18%ile	69%ile	
Otis (S.A.)* . . . . .	Raw Score	25	39	14 points
	Otis I.Q.	90	108	18 points

\* The Otis Self-administering Test is largely "verbal" in its nature, consisting of such tasks as: following directions, arithmetic problems, logical relations, opposites, disarranged sentences, number series completion, analogies, proverbs, syllogisms, geometrical memory; all activities largely dependent for their development on educational and cultural stimulation. The International Group Test, on the other hand, is "non-verbal" in its nature and can even be given by pantomime. It consists of such activities as: matching pictures, cube counting and matching, pictorial similarities, similarities in facial expression, rhythm series completion, mazes, pictorial analogies, time series arrangements, *etc.*, none of which are dependent upon training in any particular environment.

### 3. "E" and "G":

Newman's second case, twin girls, had been separated at eighteen months, reunited after twenty years, and for the seven years prior to examination, were living together. Twin "E" had grown up with a foster brother and sister in Indiana. Because of her mother's illness, "E" had been kept at home from school a great deal to help with the housework and had not remained in school beyond the fifth grade. There was little scholastic tone to the home, the mother being unable to read, and the father confining his reading to newspapers only. "G's" foster parents had died when she was seven or eight years old, and she had been transferred to a convent, where she learned to play the piano. Her parents had not been well educated but they had been ambitious for their foster child. At the age of eleven, "G" went into the academy, later through normal school, graduating at eighteen. She also graduated in piano. Following this she taught the fourth grade in a parochial school for two years, but later changed to being a doctor's assistant, giving music lessons in the evening. "E", who had earlier worked in a shirt factory for several years, later secured a position in a dentist's office, near her sister. Both girls were happy in their work.

Results of psychological tests of "E" and "G" are summarized on page 213.

TABLE 26  
MENTAL TEST DATA ON TWINS "E" AND "G"

Test		Twin "E"	Twin "G"	Difference
Stanford-Achievement (Educ.)	Educ. Age	10-11	14-1	3 yrs. 2 mos.
Stanford-Binet Intelligence ...	I.Q.	65.6	77.6	12 points I.Q.
	M.A.	10-6	12-5	1 yr. 11 mos.
International Group Test.....	Raw Score	70	98	28 points
Otis (S.A.) .....	Raw Score	11	26	15 points
	Otis I.Q.	69	84	15 points
Otis Group .....	Raw Score	62	113	51 points
	Otis "I.B."	32	83	51 points

In this study, we have a case of twin girls, brought up separately in approximately similar types of social environment, but with a distinct educational advantage for one twin. The difference in formal schooling stands out most sharply in the scores on the Stanford-Achievement Test (of school subject matter) and in the Otis Group Intelligence Test, which is also rather highly charged with educational material.

#### 4. "C" and "O":

Twins "C" and "O", boys, were separated at the age of two months, reunited only for purpose of getting acquainted at the age of twenty-two, and examined shortly thereafter by Newman. "C" had been brought up in a small Illinois town with no foster sibs; at the age of thirteen, he had moved to Lake City, Michigan. His parents had had only a moderate education, were in moderate circumstances financially, and owned but few books in their home. The father was a painter by trade. "O", on the other hand, had moved a great deal from one small Illinois town to another, had never lived in a city, and had attended village schools. His foster parents were somewhat more educated than "C's", the father being a telegraph operator who read a good deal. "O" had two foster siblings. On the whole, the environment of this pair of twins, except for the rural-urban element, was similar.

"C" had been a sickly baby, not walking until the age of two; he had had measles at twelve years, and chicken pox at ten years. "O" had had measles at eight or nine, scarlet fever and mumps at eleven, smallpox at fifteen, and tonsils and adenoids removed also at fifteen years. Both boys had graduated from high school at eighteen, after which "C" took technical training in saleswork, office work and accounting, while "O" took technical training in architectural engineering, which he discontinued, to become assistant

postmaster in a small town. Results of psychological tests administered to this pair, are summarized below:

TABLE 27  
MENTAL TEST DATA ON "C" AND "O"

Test	Score in Terms of	Twin "C"	Twin "O"	Difference
Stanford-Achievement (Educ.)	Educ. Age	17-1	15-9	1 yr. 4 mos.
Stanford-Binet (Intelligence)	I.Q.	99	101	2 points I.Q.
	M.A.	15-11	16-2	3 mos.
International Group Test ....	Raw Score	156	146	10 points
Thurstone Psychological.....	Raw Score	35%ile	17%ile	
Otis S.A. ....	Raw Score	40	32	8 points
	Otis I.Q.	110	100	10 points

### 5. Mabel and Mary:

Newman's (138) fourth case, twin girls, separated at five months, but always living within one hundred miles of each other and in communication with each other since early childhood, were examined at the age of twenty-nine. Mabel had lived on a farm since her adoption and enjoyed it; Mary, for the first six years, had lived on a farm and had then moved permanently to a small town. The climatic aspects were similar for both girls.

Mabel, the farm girl, had had measles twice, once in babyhood and once at age eighteen; whooping cough at six; and had been rarely troubled by colds or influenza. Mary, the town girl, also had had measles twice during early school age, whooping cough before school entrance, and influenza almost every winter. The influenza incidence is the only striking point of difference in disease history. This may account for Mary's physique being less robust than Mabel's, a physical contrast much greater than in either of the four cases discussed above.

Educational histories show that Mabel had completed her elementary education in a rural school, and six weeks at high school. She had never been especially interested in her studies, and has read little except newspapers and magazines. Mary had attended her town school through elementary grades and three years of high school, finishing her final year in a city high school. She had always stood in the upper quarter of her class. In addition she had studied music and later gave piano lessons in the evenings. In the daytime her occupation was clerking in a store. Her reading was also limited to magazines and newspapers.

The economic status and the religious atmosphere of both foster homes were about equal. Neither girl had traveled. Mabel had



foster sibs about her own age, whereas Mary's were at least ten years older.

In appearance the twins had always resembled each other almost to the point of identity, until the age of seventeen or later; at the time of examination Mabel was twenty-seven pounds heavier, an inch taller, a size larger in all physical measurements, and much sturdier than Mary. The great physical difference appears to have been effected in the twelve years, prior to examination.

Results of psychological tests are summarized below:

TABLE 28  
MENTAL TEST DATA ON MABEL AND MARY

Test (Educational)	Score in Terms of:	Mabel	Mary	Difference
Stanford-Achievement .....	Educ. Age	14-5	17-3	2 yrs. 10 mos.
Test (Intelligence)				
Stanford-Binet .....	I.Q.	88.5	106.2	17.7 points I.Q.
Thurstone Psychological .....	Rank	2%ile	32%ile	
International Group .....	Raw Score	94	102	8 points
Otis S.A. ....	Raw Score	30	41	11 points
	Otis I.Q.	91	111	20 points

Of especial concern in this discussion is the rather wide difference of 17 points I. Q. on the Stanford-Binet. Equally diverse are the raw score results in the Otis and Thurstone tests, always in favor of Mary, the town-reared, more highly educated girl. On the International Test, which is much less dependent on school experience, Mary's score was very little better than Mabel's; but in this connection, it is pointed out that Mary had not done herself justice in view of her expected ability as recorded on the other tests. At the time of the test, too, she is reported as having had a cold. Of chief importance, however, is the consistency of test results, the difference always being in the same direction.

6. "B" and "D":

These twins, born of very young parents, were separated at the age of fourteen months, reunited for three weeks at sixteen for purposes of acquaintance, and at twenty they lived together for two years, when "D" married. Since then they have visited only occasionally. At the age of twenty they were so similar as to be indistinguishable, and often took each other's places at work without being detected. Their pictures at the age of thirty-four still show remarkable similarity, with a more worn look for "D." At thirty-eight, the time of examination, "B" is decidedly better preserved, in stronger health, and is much younger looking than her

twin. Her teeth are white and perfect, while "D's" are badly decayed, discolored, and some are missing.

The early educational and health histories of the two women are rather similar, "B" going through the eleventh grade in town schools, "D" completing ten grades in country schools. They both had the usual run of children's diseases, with no apparent ill effects in either case. The real difference in environment began with "D's" marriage at twenty-two, to a farmer who took her to a homestead in North Dakota. During the war she "carried on" largely by herself, suffering from inadequate food, overwork, and a serious attack of "influenza" from which she never actually recovered. She bore and raised six children, and had little time or opportunity for social participation.

Twin "B", on the other hand, married "comfortably," having help in her home, social life, "heaps of friends," club memberships, and a relatively easy life, in towns. She has four children, is in good health and physical condition, and looks younger than her age.

Differences on psychological tests are summed up in tabular form below:

TABLE 29  
INTELLIGENCE AND ACHIEVEMENT SCORES OF "B" AND "D"

	"B"	"D"	Difference
<i>Educational Tests:</i>			
Stanford Achievement			
Educ. Age .....	15-2	14-8	6 mos.
<i>Intelligence Tests:</i>			
Stanford-Binet			
M.A. ....	14-10	14-3	7 mos.
I.Q. ....	93	89	4 points I.Q.
Thurstone Psychological			
Raw Score .....	30	20	10 points
% ile rank .....	.007	.003	
Otis S.A.			
Raw Score .....	31	28	3 points
M.A. ....	13-10	13-1	9 mos.
I.Q. ....	89	86	3 points
International			
Raw Score .....	74	69	5 points

## 7. Ada and Ida:

These twins, separated at three years, were re-united at age sixteen, after which they saw a good deal of each other, sometimes living together. They were examined at the age of fifty-eight. Ada had married at seventeen, separated from her husband at twenty-seven, and had reared five children. Ida had married at thirty-one,

had lived happily with her husband and had reared four children. Both women are reported as being very conscientious and religious.

The early life of these twins, both before and after adoption, is a story of hardship, misfortune, and abuse. Neither twin attended school beyond the third grade, and both are largely self-educated. The outstanding environmental difference is Ada's early and unhappy marriage contrasted with Ida's late and placid one. Ada lived more in cities, Ida mostly on farms, and largely in the Great Lakes district. It is this latter fact which doubtless accounts for a pronounced physical difference, namely, that Ida has a goitre, with marked hypothyroidism and myxedema; while Ada, who has lived on an iodine-charged diet, is in normal health, although she had showed goitre tendencies earlier in life. Results of psychological tests are as follows:

TABLE 30  
MENTAL TEST DATA ON ADA AND IDA

	Ada	Ida	Difference
<i>Educational Tests:</i>			
Stanford Achievement			
Raw Score .....	80.5	83.6	3.1
Educ. Age .....	12-7	12-11	4 mos.
Grade Equiv. ....	6.8	7.2	.4 grade
<i>Intelligence Tests:</i>			
Stanford-Binet			
M.A. ....	16-3	15	1-3 years
I.Q. ....	101.5	93.7	7.8 points I.Q.
Thurstone Psychological			
Not taken			
Otis S.A.			
Raw Score .....	26	28	2 points
M.A. ....	10-8	10-8	0 mos.
International			
Incomplete			

The rating of these two women would be about equal on the whole.

8. Richard and Raymond:

Richard and Raymond were separated at the age of one month, were reared in homes of distinctly different social status, had equivalent amounts of schooling, had contacts with each other about once every year, and were examined at the age of thirteen and a half years by Newman and his co-workers. These boys are the youngest in the series of identical twins reared apart.

Richard was adopted by a comparatively uneducated truck farmer in southern Illinois whose life was none too easy, who moved



about considerably, but who was able to provide Richard with an excellent mother. There were no foster siblings. Raymond, on the other hand, had two foster sisters much older than himself. He, too, had an excellent mother, the wife of a well-to-do physician in a large city in Indiana. Raymond has had the benefit of a richer cultural background, Richard the advantage which accrues from struggle and adaptation to changing environment, making for a more positive and aggressive personality.

Mentally both boys were of high normal intelligence; both had reached the eighth grade at school and were reported as doing well in their studies. Results of psychological examination are tabulated below:

TABLE 31  
MENTAL TEST DATA ON RICHARD AND RAYMOND

	Richard	Raymond	Difference
<i>Educational Tests:</i>			
Stanford Achievement			
Educ. Age .....	15-9	15-11	2 mos.
<i>Intelligence Tests:</i>			
Stanford-Binet			
M.A. ....	14-4	14-2	2 mos.
I.Q. ....	106	105	1 point I.Q.
Thurstone Psychological			
Raw Score .....	58	43	15 points
Percentile Rank .....	4	3	1
Otis Higher Examination			
Raw Score .....	31	36	5 points
M.A. ....	13-10	15	1 yr. 2 mos.
I.B. (Index of Brightness)....	74 (normal)	115 (normal)	41 (?)
International (Non-verbal)			
Raw Score .....	140	126	14 points

#### 9. "M" and "R":

These twin girls, sixteen years old when examined, had been separated at three months of age and adopted into widely different homes, judged from the standpoint of culture and intellectual stimulation. "M's" foster father is a well-educated and prominent man, a lawyer, a bank president, and former mayor of his town; her foster mother also has intellectual interests; her maternal aunt, living next door, is a Phi Beta Kappa graduate and a high school teacher; her older sister shares with "M" the advantage of music lessons and musical accomplishment. "M" has been encouraged to mingle freely with other people, and shows considerable social ease.

"R" was reared by "M's" foster mother's brother whose education was incomplete, extending only part way into high school.

His wife's education was even less, and includes no cultural influences. The foster father was a foreman over day laborers. Another chief point of interest is the narrow possessive attitude which "R's" foster mother has towards her, allowing her little or no social participation outside the home. This restriction, plus the lack of intellectual opportunity at home, has resulted in a decidedly suppressed personality: timid, unhappy in facial expression, lisping in her speech, and subservient in her demeanor—all in contrast to "M's" easy friendly talkativeness.

Mentally, "M" was also somewhat in advance of "R". Detailed data follow:

TABLE 32  
MENTAL TEST RECORD ON "M" AND "R"

	"M"	"R"	Difference
<i>Educational Tests:</i>			
Stanford Achievement			
Educ. Age .....	14-7	13-6	13 mos.
<i>Intelligence Tests:</i>			
Stanford-Binet			
M.A. ....	14-2	11-10	26 mos.
I.Q. ....	92	77	15 points I.Q.
Thurstone Psychological			
Raw Score .....	74	35	39 points
Percentile Rank .....	12	5	7
Otis S.A.			
Raw Score .....	101	86	15 points
International			
Raw Score .....	193	155	38 points

The above scores show a balance always in favor of "M". This is interesting because both girls experienced the same amount of schooling. The difference is easily attributable to the cultural differences in the two home environments.

#### 10. Harold and Holden:

These twin boys, aged nineteen, had been separated in early infancy and adopted, the one into a mason's home in a village of 600 inhabitants, the other to an eighty-acre farm. The boys were always in contact with each other, being separated by a distance of only three miles. Both boys attended small elementary schools, and later graduated from the same township high school, with this difference, that Holden, the farm boy, finished a year earlier than his twin.

Harold lived with four foster sibs, all older than he, one of them being a teacher. He was active in extra-curricular activities,

captain of the school basket-ball team, and a drummer in the band. Since leaving school he has served as a delivery boy, working in a neighboring town and in his own village.

Holden, the only child in his family, has been compelled by circumstances to do a large share of the work on his aunt's farm, which prevented him from sharing in school recreational and social activities. He is now more of an individualist, preferring hunting and fishing to more social indulgence. He plans to continue dairy farming, whereas Harold would choose college if that course were open to him.

Intellectually these boys are very close, which in view of their common educational features is to be expected. However, the fact must not be lost sight of that Holden's school experience was a full year less recent than Harold's. Their scores are tabulated below:

TABLE 33  
MENTAL TEST DATA ON HAROLD AND HOLDEN

	Harold	Holden	Difference
<i>Educational Tests:</i>			
Stanford Achievement			
Educ. Age .....	17-6	16-10	8 mos.
<i>Intelligence Tests:</i>			
Stanford-Binet			
M.A. ....	16-3	15-5	10 mos.
I.Q. ....	102	96	6 points I.Q.
Thurstone Psychological			
Raw Score .....	139	105	34 points
Percentile Rank .....	48	29	19
Otis S.A.			
Raw Score .....	46	41	5 points
Otis M.A. ....	16	15-2	10 mos.
International (Non-verbal)			
Omitted .....	—	—	—

These twins, it will be noticed, do not differ mentally to any significant degree.

#### Average Group Differences Between Identical Twins, Reared Together and Apart, on Stanford-Binet.

In the following table, we have summarized the quantitative data on the above ten cases (Müller's one, and Newman's nine); and in addition, have set down as control data the average Mental Age and average I.Q. (reported by Newman, 138) of fifty pairs of identical twins reared together, and fifty pairs of fraternal twins reared together. The average differences in Stanford-Binet I.Q.'s for these control groups are respectively: Identical twins, 5.3



points; fraternal, 9.9 points; and in Mental Age, average differences are as follows: Identical twins, 8.4 months, fraternal twins, 15.9 months.\* The data on average performance of the control groups on other mental and educational tests are set down, although incompletely.

It will be seen, therefore, that ten pairs of identical twins reared apart show an average intra-pair difference of 7.7 I.Q. points as compared with an average intra-pair difference of 5.3 I.Q. points for non-separated identicals—less than a two-to-one ratio. We refer, of course, to intelligence test ratings.

It will be seen also that ten sets of identical twins, separated in infancy, show an average intra-pair difference of 7.7 I.Q. points as compared with an average of 9.9 points of fraternal twins, reared together—more than a one-to-one ratio. The reader is reminded that a part of the fraternal twin resemblance is due to heredity, since siblings are known to resemble each other by a coefficient of .5. Newman estimates that fifty per cent of fraternal resemblance is a fair allowance to credit to heredity. Hence, only half of the fraternal twin resemblance (4.9 points) can be ascribed to environment. Even here we are reminded (176) that “inherited dispositions create an appropriate environment, (which) should work with greater differentiation in the case of twins of unlike inheritance than in that of twins of like inheritance,” (p. 96) or “Similar inherited aptitudes create similar environments, which, then, retroactively enhance the innate individual similarities”—while on the other hand “dissimilar inherited aptitudes make for themselves dissimilar environments which enhance individual differences.” (p. 93) If 7.7 points is the measure of the effect of environment to make homologous individuals unlike, and if 4.9 points is a measure of the effect of environment to make heterozygous individuals more alike, then the influence of environment would seem to be between 4.9 and 7.7 I.Q. points. It goes without saying that ten cases are too few to have statistical significance.

In this discussion of twin resemblances on tests, the reader is reminded also that absolute identity of twin *scores* would not be

\* Unfortunately for our purpose, Newman has not reported the age range of these two control groups of twins. He states that their *average* age was: (1) identical twins 13.4 years; fraternal group 13.5. (See our p. 222.) We take it that groups are selected to match each other; but unless all are adults, we cannot fairly compare them *in terms of mental age* with the data on identical adult twins reared apart. Mental Age is a variable that has significance in direct relation to chronological age; e.g., three months for the five-year-old is vastly more significant than three months for the adult. The intelligence quotient on the other hand, being a variable, always in ratio to chronological age, affords a satisfactory basis of comparison among all ages.

TABLE 34

SUMMARY OF DATA ON IDENTICAL TWINS REARED APART COMPARED WITH AVERAGES OF FIFTY IDENTICAL TWINS AND FIFTY FRATERNAL TWINS REARED TOGETHER \*

Case	Intelligence Tests										Achievement Tests	
	Alpha Diff. in (Raw Score)	Stanford-Binet Diff. in M.A. (mos.)	Diff. in I.Q.	Comp'son with Avg. of Control Group	Otis S.A. Difference in (Raw Score)	Diff. in (I.Q.)	Int'n'l Diff. in (Raw Score)	Stanford-Achievement Diff. in Educ. Age in Months				
Müller												
1. "B" and "J" †	3	0 †	0 †		2 (Adv.)							
Newman												
1. "A" and "O" .....		23	12	(2.26) x avg.	14	18	62	19				
2. "E" and "G" .....		23	12	(2.26) x avg.	15	15	28	38				
3. "C" and "O" .....		3	2		8	10	10	16				
4. Mabel and Mary .....		34	17.7	(3.34) x avg.	11	20	8	34				
5. "B" and "D" .....		7	4		3	3	5	6				
6. Ada and Ida .....		15	7.8		2	2	—	4				
7. Richard and Raymond		2	1		5 (Higher)	41 (?)	14	2				
8. "M" and "R" .....		26	15	(2.83) x avg.	15	—	38	13				
9. Harold and Holden...		10	6		5	6 (?)	—	8				
Average of 9 (Newman).		16.1	8.6	(1.62) x avg.	8.88	14.3 (?)	23.57	15.5				
Average of 10 (plus Müller)		14.5	7.7	(1.45) x avg.	8.0	—	—	—				
Average of fifty identicals reared together (Chicago)		8.4	5.3			4.5		6.5				
Average of fifty fraternal reared together (Chicago)		15.9	9.9			9.2		11.6				

\* Data assembled from Müller and Newman.

† Converting Alpha scores into Stanford-Binet mental ages, by Yoakum and Yerkes' table, p. 133 (229), these twins each get the same I.Q. Use of Kefauver's tables (99) earns them lower mental ages than by Army tables, but in neither case is there any difference in I.Q. for "B" and "J". Because of the scarcity of cases of separated twins, it is important that theirs should be included in the average.

expected, even if twins were psychologically identical. In an earlier chapter (pp. 51 ff) it was shown that a person differs "from himself" on intelligence tests given on different occasions, as a result of change in attitude, interest, coöperation, marginal successes and failures, and so on. Even if identical test material were given on different occasions, one would not expect an average agree-

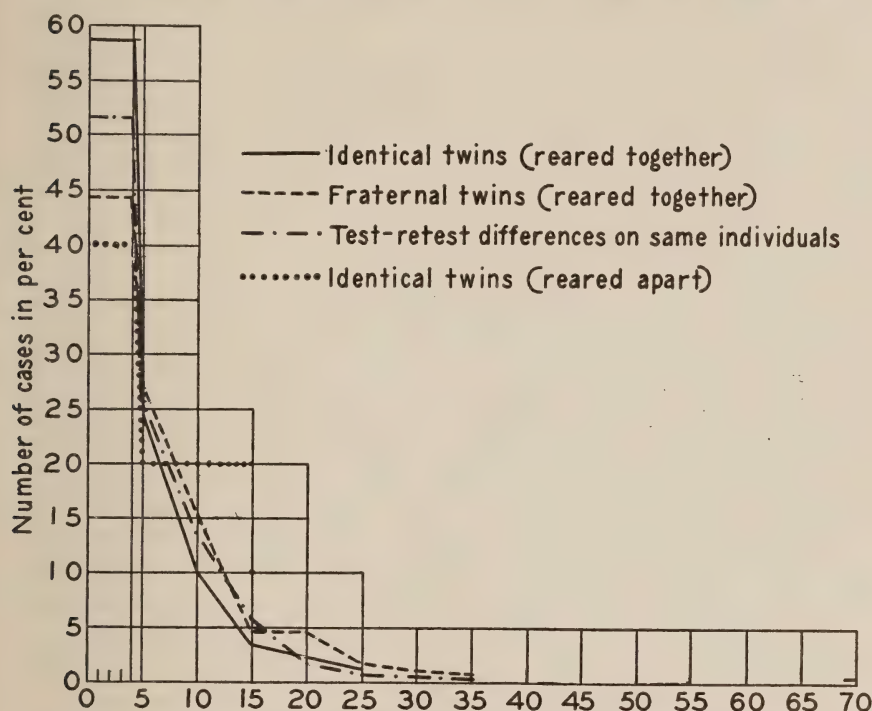


FIG. 21. INTRA-TWIN DIFFERENCES IN I.Q. (STANFORD-BINET) OF VARIOUS PAIRS. Data compiled from Tallman, Merriman, Newman, etc., based on our Table 36.

It will be noted from the above chart that identical twins reared together are more alike in test results when tested on the same day than the average individual is like himself when tested on different days. The peak in the curve for separated identical twins would be smoothed out with the addition of more cases.

ment closer than five points I.Q. on re-test. Now since an individual differs from himself on the average of five or six points I.Q., all comparisons of twin materials ought to be interpreted with this in mind. Fig. 21 shows that the distribution curve of differences in I.Q. of identical twin mates tested at one time follows rather closely the distribution curve for test-retest differences of single individuals tested at different times. In fact, sixty per cent of the identical twins had less than five points difference in I.Q., while



only fifty per cent of the individuals who took two or more tests on different occasions differed by less than five points.

In our chapter on the measurement of intelligence it was pointed out that a person may differ fifteen or twenty points from *his own I.Q.* under conditions of special advantage or incentive. Similarly, it may be expected that the mates of an identical twin pair may occasionally differ by as much as twenty points. The chart brings out these trends.

On the other hand, of considerable significance is the fact that intra-pair differences (for the separated twins above) on tests other than the Stanford-Binet are usually consistently in the same direction. This trend makes each difference more significant than if it stood alone.

### Variability of Intra-twin Differences

This matter of "spread" or variability of differences is an interesting one, running as it does from zero, or none at all, to twenty or more I.Q. points. Newman has not yet published data on the *variability* of intra-twin differences for his control groups. In Holzinger's article (92) variability is considered to be highly significant in the interpretation of twin data. Other studies on identical twins report a "bunching" at the zero end (*i.e.*, a great many identical twins earn the *same* scores on test); with a dwindling down in the direction of wide differences between each other (*i.e.*, but few identical twins earn markedly different scores on a test). Newman (133) reported that among his non-separated fifty-pair group of identical twins, five pairs (or ten per cent) differed from their mates on tests, by as much as twelve points I.Q. These cases run as follows: 12.6, 12.9, 13.0, 13.9, and 16. Four of the ten *separated* identical twins show intra-pair differences of twelve or more I.Q. points. Unless a great many more cases of twins reared apart become available, we cannot validly turn this representation into percentage of a whole.

It may be thought that cases showing such marked differences are not to be found among other groups of identical twins reared together. With this in mind, several collections of twin data were examined for range and variability of intra-twin differences on the Stanford-Binet. Unfortunately, several of the investigators who reported averages, failed to report variabilities, and it was not possible to get what we were most concerned in. However, partly through the foresight of those writers who published their raw data, and through the courtesy of Miss Tallman who freely allowed the

present writer access to her case records, the comparative tabular material (Table 36) and chart (Fig. 22) have been made possible.

TABLE 35  
INTRA-TWIN DIFFERENCES ON INTELLIGENCE TESTS \*

Investigator	Identical				Fraternal			
	Average	P.E.'s	Range	N	Average	P.E.'s	Range	N
Merriman (S-B test).....	4.9		0-19	22	8.2		0-24	83
Lauterbach (Grp. test) ..								
Tallman (S-B test).....	5.08	.469	0-29	63	7.37	.624	0-43	39
Wingfield (Grp. tests)....	6.23			45	11.74			57
Hirsch (Grp. tests).....	2.3			38	13.8			58
Averill and Müller (S-B)	None				5.7		0-20	10
Bakwin (S-B test) .....	4.0		0-14	13	—			
Chicago Studies (S-B)...	5.3		0-16	50	9.9			50

\* Data assembled from published sources, and Tallman's records.

Inspection of the above figures reveals that even for identical twins, reared together, in an extreme case the intra-pair difference can mount up to as much as twenty-nine points (to be seen in the Tallman data). This case, as noted by Tallman on her record, was one of deafness in one of the twins. Her next closest case of large differences was one of twenty points, another of eighteen points. (Here injury was recorded for one member of the pair.) Then followed one case each, for intra-pair differences of seventeen, thirteen, and twelve points. The remainder were all below ten points. Merriman has one identical intra-pair difference of nineteen points, and one case of thirteen; the remainder fall below eight points. Bakwin (9) reports one case of twelve points difference, and one of fourteen points; and Carter (22) reports one of twelve.

Summary

The results of the studies of twins reviewed above may be summarized as follows:

(1) There are clearly two types of twins, different in origin: "Identical" and "fraternal." Identical twins are of uniovular and monozygotic origin, and fraternal twins of binovular or dizygotic origin. The development of "identical" twins may be influenced by the age when ovular or embryonic separation takes place, and by intra-uterine placement. About twenty-five per cent of all twins, and forty per cent or slightly more of all like-sexed twins are identical.

(2) Identical twins, selected on the basis of resemblance in physical traits, are found to be much more alike in test intelligence than fraternal twins, even than fraternal like-sexed twins. Corre-

lation coefficients in the vicinity of .88 to .90 have been reliably established in the case of identical twins in contrast to the coefficients in the vicinity of .60 to .70 in the case of fraternal twins

TABLE 36

DISTRIBUTION OF INTRA-PAIR DIFFERENCES IN I.Q. FOR IDENTICAL TWINS AND FRATERNAL TWINS, AND TEST-RETEST DIFFERENCES FOR SAME INDIVIDUALS \*

Intra-pair Difference	Twins Reared Together Identical (Tallman, Merriman, Bakwin Data) %	Twins Reared Together Fraternal (Tallman, Merriman, Averill Data) %	Test-Retest Differences (Hildreth- Lincoln School Data) %	Identical Twins Reared Apart (Müller Newman Data) (10 Cases)
0-4 .....	58.9	44.4	51.5	40
5 .....	24.5	26.9	25.7	20
10 .....	10.	15.2	13.8	20
15 .....	3.3	4.7	5.6	20
20 .....	2.2	4.7	1.8	
25 .....	1.1	1.8	.8	
30 .....		1.1	.6	
35 .....				
40 .....		.6	.1	
45 .....				
50 .....			.1	
55 .....				
60 .....				
65 .....				
70 .....		.6		
Total .....	593.5	842.0	683.0	800.
Avg. ....	5.9	8.4	6.8	7.7

\* Source of data as indicated.

(Holzinger and Wingfield data). The average intra-pair difference in I.Q., as determined by the Chicago investigators is 5.3 in the case of identical twins, and 9.9 in the case of fraternal twins. On

TABLE 37

AGE DISTRIBUTION OF THE GROUPS DESCRIBED IN TABLE 36

	Twins Reared Together Identical	Twins Reared Together Fraternal	Test-Retest Differences (Same Individuals) School age	Identical Twins Reared Apart
Md. ....	10.1 yrs.	9.8 yrs.		Adult
Q <sub>1</sub> .....	8.2	8.1		Adult
Q <sub>2</sub> .....	12.5	12.3		Adult
Range .....	5-15	3-16	3-18	13-58
N. ....	90 prs.	171 prs.	1112 prs.	10 prs.

the basis of these results Holzinger and Newman conclude that genetic constitution exerts an influence which is approximately equal to the influence of environment in accounting for average group differences between identical and fraternal twins. Practically



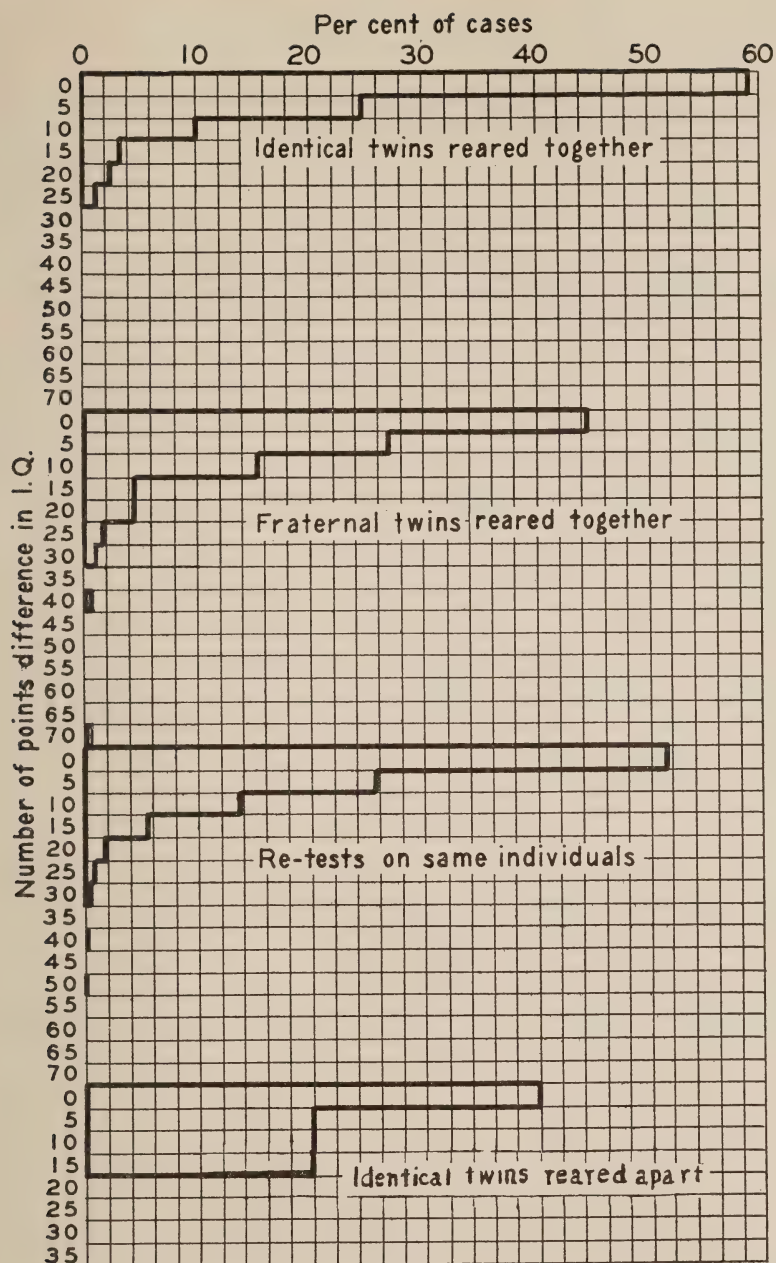


FIG. 22. DISTRIBUTION OF INTRA-PAIR DIFFERENCES IN I.Q. FOR VARIOUS PAIRINGS OF TWINS; ALSO TEST-RETEST DIFFERENCES. Data from Table 36.

all other investigators have ascribed even greater weight to the hereditary factors.

Holzinger's results, however, indicate that heredity may exert a considerably greater influence than environment in accounting for *individual variation* of intra-twin resemblance. Nature factors thus receive a higher value than nurture factors when effects on *variability* are measured.

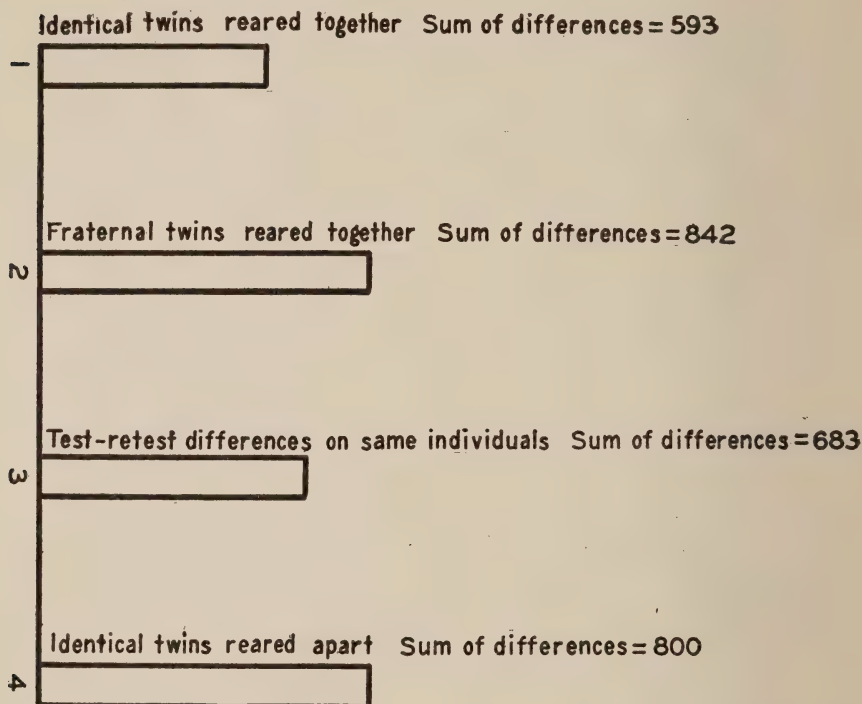


FIG. 23. AGGREGATE OF INTRA-PAIR DIFFERENCES IN I.Q. FOR VARIOUS GENETIC GROUPINGS.  $N = 100$  for Each Group Except for No. 4, which Consisted of 10 Cases (X Ten). Data from Table 36.

(3) In most studies no significant differences in intelligence are found between older and younger twins, especially between older and younger identical twins. The Chicago study shows more marked differences with age for fraternal than for identical twins. Apparently environment can be more effective in effecting differences where there is initial genetic variation than where there is none.

(4) The degree of resemblance in traits whose accomplishment depends on training, is not noticeably higher than the accomplishment in traits not dependent on training.

(5) Gesell and his co-workers, by the use of co-twin control technique, have shown that training in the early years is highly dependent upon maturation of neural and muscular structure. This principle may be applicable to verbal as well as to motor training.

(6) Among the ten cases on record of identical twins reared apart since infancy, but coming together and objectively studied in maturity, there is, in six cases, no significant difference in tested intelligence: (a) "B" and "J" differ by three raw score points on Alpha; (b) "C" and "O" differ by two points on Stanford-Binet I.Q.; (c) "B" and "D" differ by four points on Stanford-Binet and less on other tests; (d) Ada and Ida by seven points on Stanford-Binet and almost none on other tests; (e) Richard and Raymond differ by one point I. Q.; and (f) Harold and Holden by six points. This agreement is the more striking because in one case ("B" and "J") there was much discrepancy in formal education, although possibly not in the cultural levels of the homes. This pair show superior intelligence. The pair ("C" and "O") had about equal schooling, and show ordinary intelligence. "B" and "D," Richard and Raymond, and Harold and Holden had almost equivalent schooling; while Ada and Ida, each having only a third grade education, both register normal intelligence. In two cases, twelve points difference in intelligence quotient is found between the twins, while the mates in the remaining cases differ by fifteen and seventeen points. A difference of this degree (12 points) or greater is found in ten per cent of the identical twins reared together in the Chicago sample and has been noted in other collections of identical twin data. In one case ("A" and "O") the twin making the lower score has a record of lower social status and malnutrition (in England, during the war), but schooling about equal in amount to that of the co-twin, although less academic in character. Her I.Q. is 84.9; her sister's is 96.9. In another case ("E" and "G") the twin making the lower score (I.Q. 66) had been kept home from school a good deal to help with housework. Her sister (I.Q. 76) had had an irregular, but apparently more favorable, nurture and education. In the case of "M" and "R" there were pronounced differences in cultural levels of the home; and in parent-child relationships which resulted in definitely different temperaments for the two girls. For Mabel and Mary the items of distinction were four years difference in schooling and rural *versus* urban residence. The lesser-schooled farm girl recorded 88.5, the urban and more educated twin 106.2 I.Q.

(7) To generalize on the basis of ten cases is not reliable, but



a summary of these ten is permissible. The *average* of their intra-pair differences is 7.7 I.Q. points and the *variability* is from zero to seventeen points. These summaries can be compared with corresponding figures obtained on identical twins reared together, whose *average* intra-pair difference in I.Q. is 5.3, and whose *variability* is from 0 to twenty (or twenty-nine) points. These figures can also be compared with fraternal twins reared together, whose average intra-pair difference is 9.9 I.Q. points, and whose *variability* ranges from zero to forty-three points. They can also be compared with test-retest differences on the same individuals whose average inter-test difference is 6.8 points, and whose variability ranges from zero to fifty-three points. (Table 36.)

### CONCLUSIONS

By far the greatest interest attaches to a comparative study of identical twins reared together with identical twins reared apart; but until more data, accurate as to detail, are assembled on such twins separated in infancy, it is impossible to draw final conclusions on the effects of differences in environment on development of test intelligence. Workers must be cautioned against making deductions that, merely because the twins have been separated, their environments have been essentially "different." It is quite possible for two separate foster homes, having relatively similar standards and requirements, to be highly "similar" (*e.g.*, as in the case of Ada and Ida). It is equally possible, on the other hand, for two different environments to obtain within the one physical home—as illustrated in the case of Esther and Naomi (127). To capture these subtle factors and operations of environment, rather careful measuring devices must be standardized and employed.

Such "measures of environment" are comparatively new, having only made their appearance within the last five years or so of sociopsychological research.

This introduces a second caution to the student of environment, namely, the need to guard against interpretations based on differences of group averages. Variability of test intelligence within groups is even more significant than their averages; a comparison of two sets of variation is as important as two sets of averages; and variability of one factor must always be studied with respect to variability of all possible influencing factors.

If the environments of separated pairs—individuals or groups—were rated quantitatively, new interpretations would be inevitable; and the *extent* to which *degrees of specific environment* corre-

sponded with *intellectual variation* could be found. In the meantime, we have to depend, much less accurately, on social history reports based in large part on highly uncertain personal memory, opinion, and anecdotal account.

ii. *Mental Resemblance of Genetic Groups and Socially Related Groups Reared under Usual Conditions in Same or Similar Environment, Studied for Comparison with Individuals from Such Groups When Reared Apart*

SIBLINGS REARED TOGETHER

The degree of similarity in test intelligence reported for identical twins reared together was .90. For siblings reared together the average is around .5, indicating a very much lower degree of resemblance; a result which has been subject to constantly changing interpretation ever since studies of this sort were inaugurated by Francis Galton over half a century ago. The earlier investigators, apart from the inadequacy of their tools of measurement, did not tend to allow for similarities of environment roughly proportional to the degree of genetic relationships, and therefore reached conclusions on the heredity-environment problem by comparing correlations for twins with correlations for siblings. Furthermore, they lacked knowledge of the mechanism of heredity, and hence were led to draw conclusions by comparing correlations of general intelligence with those of the simplest physical traits such as eye color; and while their reasoning is impressive and convincing to the layman, it will not stand up under careful analysis, especially an analysis made in the light of modern knowledge of genetics. Reasoning from physical similarity to consequent mental similarity is also without justification. (19)

If human matings took place only between individuals of the same stock, and only within stocks homologous for all their traits (that is, composed of a number of identical individuals), then we could expect a perfect correlation between sibs in respect of those traits which are hereditary and not affected by environment. The index of correlation for each trait would be a measure of the extent to which the trait had been affected by such differences in environment as exist between sibs.

But human matings rarely take place between individuals of the same stock, and no human stock is homologous except identical twins or triplets, each group of which is necessarily of the same sex and cannot reproduce within the group. The purest family lines

TABLE 38

SUMMARY OF CORRELATIONS OBTAINED IN MANY RESEARCHES ON THE RESEMBLANCE BETWEEN SIBLINGS IN INTELLIGENCE  
( $r$  = Coefficient of correlation on a scale from 0 to 1.)

Study (For numbers see Bib.)	N	$r$	Test	Remarks
Galton, 1869 (60) .....	1000		Own 5-step scale	Regression of children is $\frac{2}{3}$ toward mean of parents
Pearson, 1904 (146) .....	2000	.52 $\pm$	Own 5-step scale of ratings on certain mental characteristics	Average of 8 $r$ 's from .44 to .49
Schuster and Elderton, 1907 (72) .....		.45 $\pm$ .398	Oxford records Harrow and Charterhouse records	Mean of 8 coefficients ( $r$ 's from .25 to .49. Mean $r$ = .39)
Starch, 1917 (187) .....	18	.38	Psychological tests of mental processes	Traits not subject to training
Pintner, 1918 (152) .....	180 prs.	.42	Quantitative scores on tests of school achievement	Traits subject to training
Gordon, 1919 (86) .....	91 "	.22 $\pm$ .02	Pintner Survey Group	
1920 (81) .....	216 "	.53	Stanford-Binet	Orphan sibs.
Pearson, 1918 (149) .....	216 "	.61	" "	"
	2,801 "	.50 $\pm$ .05 .51	Ratings on a 6-point scale	Gordon's data, rendered symmetrical Children from widely different environments
Elderton, 1923 (46) .....	216	.53 $\pm$ .02	Stanford-Binet	Gordon's data; Age held constant; table symmetrical
Madsen, 1924 (110) .....	(Children in two school systems) 63 prs.	.47 (1 Q.s) .51	" "	English sibs. Drinkwater's data
Hart, 1924 (83) .....	252 "	.63 $\pm$ .05	Teachers' estimates	
	147 "	.447 $\pm$ .034	Alpha, Nat. and S.B.	Ages 10 to 15 years
	219 "	.459 $\pm$ .066	Stanford-Binet	Elementary school, rural
Rensch, 1924 (121) .....	7 groups (784)	.399 $\pm$ .057	" "	Univ. school, urban
Pintner, 1924 (153) .....	53	.49 .33	Terman group Group Intell.	Average of seven $r$ 's from .34 to .61



Hildreth, 1925 (84) .....	1028 prs. in several groupings	.27 to .68	Stanford-Binet	r's vary depending on size and variability of the groups
	78 prs.	.32 $\pm$ .04 .49 $\pm$ .06	" "	Sibs reared together in the orphanage
			" "	Sibs separated on the average 4 to 5 years
Thorndike, 1928 (125) .....	489	.60	I.E.R. Group	H. S. only
Lauterbach, 1925 (112) .....	253	.49	Dearborn & Nat. Group.	Univ. and H. S. students
Davis, 1928 (33) .....	640	.40 & .41	Dearborn & Haggerty	Orphanage residents
	504	.52 & .43	" "	P. S. children
Willoughby, 1928 (125) .....	280	.42	11 selected sub tests	
Jones, 1928 (125) .....	828	.49 $\pm$ .018	Stanford-Binet & Alpha	New England rural children
Banker, 1928 (13) .....	83 prs.	.45	Student Ability Index	Based on school records within one school system
Sims, 1931 (180) .....	203	.44	Otis S.A. Group	Brought up together, partly in English orphanages
Lawrence, 1931 (113) .....	105	.49 $\pm$ .05	Simplex Index	
Outhit, 1933 (141) .....	257	.42 to .72	Alpha and S.B.	First-second and first-third sibs

produce individuals differing enormously among each other, and the so-called "pure" races are extraordinarily mixed.

In this connection the reader is reminded that a coefficient of resemblance is significant in respect to any particular variable, only in so far as we understand and can equate for all the other variables which go to make up the resemblance. In general the degree of sibling resemblance is dependent upon four variables, as follows:

1. The purity and similarity of the stocks of the parents.
2. The method of genetic transmission of the trait involved.
3. The susceptibility to environmental influences of the trait involved.
4. The degree of difference in the environments.

Recognition of the part played by the first two variables named above is due to knowledge of genetics obtained since Galton's time and even now not clearly grasped by psychologists. Jones (125) has brought out the importance of assortative mating in interpreting biometric studies of inheritance. Carter (23) gives an excellent summary (pp. 25-35) of some fifteen studies of marital resemblance in various traits. His conclusion is that,

"The evidence points unmistakably to the fact that like tends to mate with like, where the traits under consideration are such as to be a factor in selection, and even in traits not directly considered but which are related to those facts upon which selection depends." (p. 35)

This trend does not, of course, preclude unlike mating in respect to many hundreds of traits for any pair of mates.

Galton envisaged inheritance as a blending of parental characteristics. We know now that inheritance of characteristics takes place through transmission of parental genes, some characteristics being determined by the presence of a single gene, others by the interaction of two or more, or even a very great number of genes. In this latter case there may be a very real blending of inheritance. In single gene inheritance Mendel's law of segregation is visibly operative, the characteristic being inherited in its entirety or not at all. Fisher (53) worked out the mathematical probabilities of the inheritance of single gene and multiple gene characteristics in great detail in a work to which perhaps too little attention has been paid in this country. In general it may be said that the results in the case of multiple gene characteristics are similar to what we might expect were a true blended inheritance possible, while for single gene or two gene factors, the reverse is true. Unfortunately, we as yet know so little about human genetics that the method of

transmission of only a few characteristics has been ascertained with certainty.

It is evident that in the case of characteristics *which are of single gene origin* the extent of correlation between siblings will vary directly with the similarity of the parents as respects their genetic constitution. If, for instance, all parental mates in a group are of pure brown-eyed stock, all the children will be brown-eyed, and the sib correlation will be 1. However, if one group of parents, themselves brown-eyed, were born of mixed blue-eyed and brown-eyed stock, and the other parents were of pure blue-eyed stock, the children, if a large enough number of such parents and their children were studied, would be one-half brown-eyed and one-half blue-eyed, and the sib correlation may range from  $r = 1$ . to  $r = .0$ , *depending entirely upon the selective mating of the parents.*

In the study of even a very large group of sibs, the influence of selective mating would not necessarily be leveled off; ethnic groups with many similar characteristics may mate within the group to produce a high sib correlation as respects certain characteristics, or may intermarry with ethnic groups of different characteristics and so produce children with very low sib correlation in certain characteristics. (212) Recently Outhit (141) has found a coefficient of  $.741 \pm .042$  between husband and wife on mental test ratings.

The modern investigator uses coefficients of correlation between siblings reared together chiefly for purposes of comparison with similar coefficients for siblings reared in different environments, and aside from their historical interest, it is for that purpose that they are here recorded.

Rather than present a few of the very numerous detailed studies on this subject, the major material has been gathered in Table 38 showing the historical sequence of the studies and the coefficients obtained.

#### PARENT-CHILD RESEMBLANCE: LIVING TOGETHER

No less interesting is the presentation of evidence of parent-child resemblance in intelligence. This has been summarized here in three groupings: (1) By submitting a table assembling the results found by different investigators who used correlation coefficients to indicate how closely children resembled their parents in mental qualities. Incidentally, this table has been drawn to include resemblance found between cousins and also between grandparent and child.

Table 39 sums up the results obtained in various investigations



TABLE 39  
SUMMARY OF CORRELATIONS ON INTELLECTUAL RESEMBLANCE BETWEEN PARENTS AND CHILDREN, COUSINS, ETC.  
Genetic Groupings

Author	N	Parent-Child r	Cousins r	Grandparent Grandchild r	Members Selected	Test
Pearson, 1903 (146).....	Large	.47			Father-son	Physical measurements
Woods, 1906 (223) .....	504	.3007 $\pm$ .0472		.1506 $\pm$ .0367	Father Grandfather Son or D.	10-step scale for intellectual and moral traits
Schuster & Elderton, 1907 (172) .....	—	.312 (av. of 5 r's)			Father Son	Oxford records of acad. standing 7-step scale Family records
Elderton, 1907 (44) .....			.34 (avg.)		Father and son	
Pearson, 1910 (147) .....	Large	.49 (mean of many)			Children and two parents	
Pearson, 1915 (148) .....	"	.707 (multiple R)				
Dexter, 1924 (40) .....			.28 (avg.)			
Willoughby, 1923 (217) ..	—	.35			Child and avg. of both parents	Haggerty, N.I.T., Binet
Jones, 1928 (125) .....	105 317 317	.693 $\pm$ .034 .508 $\pm$ .028 .548 $\pm$ .026			Mid-parent, mid-child Father and child Mother and child	11 sub-tests. Verbal and non-verbal Stanford-Binet " " "
Freeman, 1928 (125), p. 138 .....		.35 $\pm$ .11			Mid-parent and each child	Otis Group Stanford-Binet
Burks, 1928 (125) p. 278 .....	100	.52			Mid-parent and child	Binet
p. 314 .....	100	.45 $\pm$ .05			Father M.A.	"
p. 316 .....	105	.46 $\pm$ .05			Mother M.A.	Students ability index based on school marks
Banker, 1928 (13) .....	83	.49 $\pm$ .05			Mid-parent and child	Children 14 and 16 yrs.
Outhit, M. C., 1933 (141)	51	.77 to .80 .40 to .68			Mid-parent, mid-child Single parent, single child	

of family resemblance. It may be noted that the coefficient of correlation between natural parent and child is around .3 (or between both parents and children around .7).

(2) A second body of evidence on the mental resemblance between parents and their children is set down in the following table taken from Pintner (1956). In this review children's scores on tests have been classified according to the social and economic levels of their parents, as rated by the vocation pursued. Pintner (1956) points out that the trend for test scores to improve with change from the lower to the higher occupation levels is to be noted almost as much among the offspring as it would be were parent's scores to be distributed instead. These scores of children can be compared with Army data on adults. Even before school has had an opportunity to exert its effect on the children the trend is noticed, and it persists into high school and college, although here, as Pintner cautions, the "selective factor" for all occupational levels is evident, due to the dropping out of the duller individuals from grade to grade.

(3) A third set of data on parent-child resemblance similar in point of attack to the second set above, is to be found in Duff and Thomson's (42) report.

Duff and Thomson's study of children according to their parental occupations is set down separately, because with them a deliberate effort was made to group the occupations in such a way as to show *difference of social standing*, of skill and responsibility; and to group the man by his *standing* in the industry rather than according to the nature of the work engaged in. A later reclassification produced two groups: (a) Those whose parents engaged in writing, teaching, giving orders, or selling; (b) Those whose parents' work was making, mending, moving, growing, or tending any kind of goods. "Brainwork" and "handwork" were offered as convenient, if inexact, captions for these two kinds of activities. Needless to say, overlapping is bound, at times, to occur.

Altogether 13,419 school children in the elementary and secondary schools were tested by No. 2 Northumberland Mental Test, and the I.Q. data were grouped according to the parental classifications discussed above. Their findings are set down in tabular form. The results are interesting to compare with American results, since it is usually conceded that classes are more stratified in England than in America, there being less opportunity for the unusual individual to move away from his congenital level into one which is socially higher or lower.

TABLE 40  
INTELLIGENCE OF CHILDREN BY PARENTAL OCCUPATION \*

Occupation	Preschool		Elementary School										High School		High Sch. and College		College								
	Goodenough (1928)	Mean I.Q.	Goodenough (1928)	Test II Mean I.Q.	Bridges (1917)	C.M.A. on Point Scale	Presssey (1919)	% above Group	Dexter (1923)	Collins (1928)	Hagerty and Nash (1924)	Median I.Q.	Nash (1924)	Hagerty and Nash (1924)	Book (1922)	% above State	Median	Sandiford (1926)	Bear (1926)	Median Score	Bear (1928)	Median Score	West (1929)	Mean I.Q.	
Professional	116	116	125	120	142	85	115	114	116	121	60	105	51	50	109	105	101	51	50	105	101	105	101	105	
Semi-Professional	112	112	120	113	126	121	106	104	107	112	60	103	48	50	56	103	48	52	50	56	109	50	109	109	
Managers							68			113	54										46				
Executive																									
Clerical																									
Business																									
Salesmen																									
Proprietors																									
Tradesmen																									
Foremen																									
Skilled																									
Artisan																									
Farmers																									
Semi-Skilled	105	105	108	107	83	39	92	99	98	99	106	108	102	102	102	102	102	102	102	37	43	43	111	111	
Slightly Skilled	104	104	107	96																					
Unskilled	96	96	96	96																					
Laborers																									
Unknown																									
n	380	380	380	380	300	548	2,782	4,727	8,121	8,121	8,121	47	5,052	95	172	172	172	172	172	172	172	172	172	172	172

\* From Pintner, R. *Intelligence testing*. Holt, 1931. P. 515.



TABLE 41

I. Q.'S OF CHILDREN ACCORDING TO PARENTAL OCCUPATION \*  
(English Data)

		95	100	105	110		
B.	A	Professional				112.2	
	B	Managers				110	
	C	Higher Commercial Class				109.3	
	D	Army, Navy, Police, Postman				105.5	
	E	Shop Keepers			105		
	F	Engineers			102.9		
	G	Foremen			102.7		
	H			102	Building trades		
	I			100.9	Metal workers, ship builders		
	J			100.6	Misc. industrial workers		
	K			97.6	Miners, Quarrymen, Excl. Mgrs., Foremen, etc.		
	L			97.6	Agriculture—all classes		
	M			96	Low Grade Occupations, labourers		
C.							
	Brainwork	1,722	children, avg. I.Q.	.....		106.6	
	Handwork	10,848	children, avg. I.Q.	.....		98.6	
			I.Q. = 100				
	D—	D	C—	C+	B	B+	A A+ Total
Brain	..... 61'	140	321	478	459	204	51 8 1,722
Hand	..... 1,160	1,700	2,964	2,815	1,655	475	71 8 10,848

\* From Duff and Thomson, 42, p. 196f.

Again will be noted the trend for children's test intelligence to follow the trend of their fathers through successive social levels.

MENTAL RESEMBLANCE AMONG UNRELATED INDIVIDUALS

The preceding data on resemblance to be found for varying genetic relationships have been introduced largely for purposes of comparison with the studies in iii (pp. 247 ff). In general, the closer the hereditary background of two or more individuals, the closer the mental resemblance. When two unrelated individuals, however, selected from the population at large are compared, then no resemblance is to be expected. Several investigators have reported such studies among children paired at random. The results are here set down in Table 42, and are interesting, because unlike the family groups, the coefficients of resemblance here uniformly cluster around zero, except in the case of Sims' (180) report in which children were paired, not by test performance, it is true, but by social levels—which, as we have seen, correlates with test performance, and to that extent can be considered a substitute for it. Hence, if Sims finds mental resemblance among unrelated children within similar social levels, it does not confuse the evidence, but

TABLE 42  
SUMMARY OF CORRELATIONS ON THE INTELLECTUAL RESEMBLANCE BETWEEN UNRELATED INDIVIDUALS

Study	N	r	Test	Remarks
Pintner, 1918 (152).....	151 prs. 300 "	.14 .19	Pintner Survey Group "	Chance selection of unrelated school children. Pintner compared these r's with sib r's.
Madsen, 1924 (119).....	63 "	-.04	Stanford-Binet	Paired associates from two different schools.
Pintner, 1924 (153).....	63 "	.09	Group intelligence	
Hildreth, 1925 (84).....	47 "	-.103 ± .10	Stanford-Binet	
	47 "	-.169 ± .10	"	
Davis, 1928 (33).....	100 "	.033 ± .034	Dearborn, Haggerty Group	
	100 "	.111 ± .001	Dearborn, Haggerty Group	
Sims, 1931 (180).....	203 "	.35	Otis, S.A., Group	
	203 "	.05	Otis, S.A., Group	
				Rearred together in an orphanage for 10% to 25% of lives.
				Rearred together for 50% to 100% of lives.
				Orphanage residents.
				P. S. children.
				Non-sibs matched for home background.
				Unmatched as to home background.

bears out the studies set down in the preceding as well as the next few pages.

Random pairing of unrelated individuals drawn from a normal distribution is bound, *ipso facto*, to result in a zero or near zero coefficient; this would operate even for pairings of sibs in one family of infinite size. To obtain an appreciable correlation some selective factor, having variation in itself, must be at work, such as age, social status, different heredities, *etc.* Any factor making for resemblance among unselected individuals would tend to make all the members of the group resemble one another, and not to discriminate in making *paired* resemblances. To this extent it seems rather ridiculous to pile up correlation coefficient data for individuals paired purely by chance assortments.

#### SOCIO-ECONOMIC GROUPS: RELATIONSHIPS TO BE EXPECTED WITHIN DIFFERENT OCCUPATIONAL AND SOCIAL LEVELS. BOTH NATURE AND NURTURE INFLUENCES PRESENT

Several studies have been made of the distribution of intelligence according to varying occupational or social levels. But not all of these studies are comparable because different methods of classifying or grouping occupations have been used. The first quantitative evidence of correspondence between mental ability and occupational pursuits came out in the publication of the U. S. Army (228) data. Since then many lesser reports have been issued. In England, too, the field has been rather thoroughly investigated, and because of the different conditions of social origins for that country, it presents material of distinct comparative interest. A few reports only will be here included of the distribution of adult intelligence according to economic levels. In the tabular matter on pages 238 and 239 it was seen that successive increments from low economic levels to high economic levels are as pronounced in the children as in their parents. This, of course, does not answer the question of whether these children resemble their parents because of their genetic relation to them, or because both are subjected to the same type of culture.

(1) The following chart, taken from the Army Memoirs report (228), gives us a picture of the hierarchy of mental levels for different occupations. Intelligence was measured by the first Army Alpha group test, now more or less discredited, and these tests were given to drafted men who may not have been fair representatives of their occupation groups; the testing conditions were often disorganized and unfair to certain testees; yet, inadequate as these



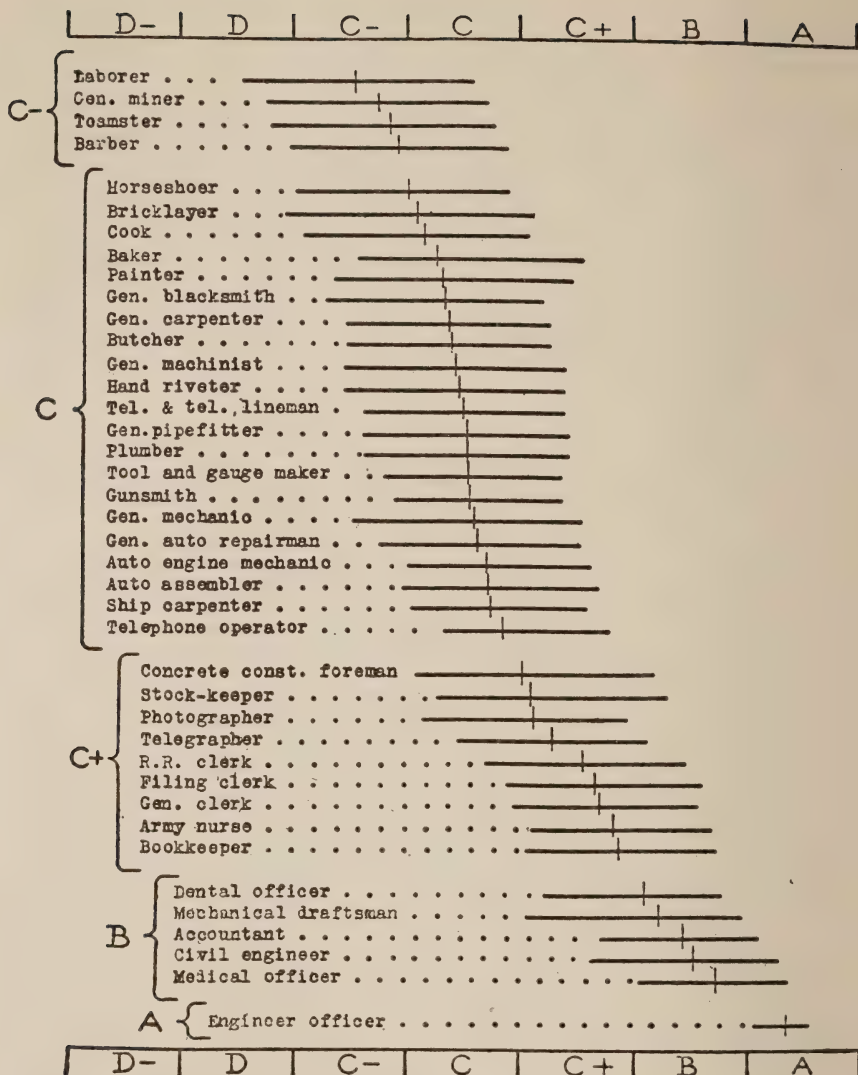


FIG. 24. DISTRIBUTION OF INTELLIGENCE BY OCCUPATIONS. From R. M. Yerkes, *Psychological Examining in the U. S. Army. Memoirs Nat. Acad. Sciences, 1921.*

Occupational intelligence ratings are shown by letter grades on horizontal scale. Length of bar for each occupation includes the middle fifty per cent. Median point is indicated. (228)

results are, they show in no vague fashion three things: (1) That the average intelligence levels of different occupations *rises* from that required to do the simplest and roughest type of unskilled labor, through skilled labor, the trades, clerical workers and professional workers. (2) In any one group there is a wide range of ability, a few individuals being much duller than the average of their group, and a few being very much brighter. (3) There is a great deal of overlapping among groups, as a glance at the chart will show; the dullest general mechanic (in the middle fifty per cent) being no brighter than the average unskilled laborer, and the brightest unskilled laborer (in the middle fifty per cent) being on a level with the average mechanic; the brightest bricklayer earns the same rating as the dullest dentist (in middle fifty per cent).

The relationship between intelligence and social status has been studied by the correlation method as well as by the method of group averages and dispersions. The chief difficulty here is to secure an adequate measure of social status, for the correlation method requires a scale of grades or rankings within each variable. Different investigators have resorted to different devices for estimating the grade of social background, but as the scales improve it is to be hoped that more reliable studies can be made. Pintner (156) sums up in tabular form the findings of four studies which have employed the correlation method in studying resemblances between children and their homes.

TABLE 43

	r	N	
Chapman & Wiggins, 1925....	+.32	632	I.Q. on N.I.T.
Stroud, 1928 .....	+.25	1,057	Tax assessment and I.Q.
Chauncy, 1929 .....	+.21	113	Grade VIII Sims' score
	+.19	130	Grade IV " "
Sirkin, 1929 .....	+.36	845	Grade IV
	+.43	850	Grade V
	+.39	682	Grade VI

\* From Pintner, R. *Intelligence testing*. Holt. 1931. P. 517.

(3) Other contributions on the variation of abilities with variation in social levels have been made. Among these an interesting point of view is presented by Terman (195) in his analysis of the background of gifted children. Terman finds that the higher occupational groups, especially the professions, far exceed their quota in contributing bright children to the world. He sums up his vocational representations among the gifted and the whole population as follows:

TABLE 44

PROPORTION OF GIFTED CHILDREN COMING FROM FOUR OCCUPATIONAL LEVELS OF THE POPULATION \*

	Gifted Per Cent	General Per Cent	Quota of Gifted Children Per Cent
Professional .....	29.1	2.9	1003.
Public Service .....	4.5	3.3	137.
Commercial .....	46.2	36.1	128.
Industrial .....	20.2	57.7	35.

\* From Terman, 195, p. 63.

(4) The study of different intelligence averages for different social levels is to some extent tied up with the problem of selection according to various *national* immigrants into this country. For instance, Kempf and Collins (103) studying a large group of children in Illinois and classifying these children into three broad occupational groups (children of unskilled laborers, skilled laborers, and professional or salaried people) found as usual that the median I.Q. of the children in the professional and salaried groups was considerably higher than that of the children of laborers, and that the children of unskilled laborers were lowest of the three groups. When, however, these children were reclassified to allow for racial stock (native white parentage and grandparentage), the differences were not so large but still noticeable. It would appear that the unskilled laborers tend not only to be recruited from the ranks of certain nationals in this country, but also from the less intelligent natives; their children in turn tend to retain the mental status of their ancestry.

These data are included here to show that in general individuals within one socio-economic group tend to resemble each other (180) more than they resemble other groups; that the average of a group is an indication of what level of intelligence could be assigned to a similar group not tested; that such a measure can be applied only to groups, and not to any individual within a group, because of the wide range of individual differences to be found in each group. If, at some time, it is desired to transfer a number of infants from their native social medium into one of higher or lower degree, the scores made by these (adopted) children (after a fair period of development) can be matched with the scores which they could be expected to have made had they remained in their own homes. Thus, studies of the sort here reported can serve as a "control."



## RACIAL GROUPINGS

The intellectual resemblance among individuals of different racial classifications will not be discussed here. For details the reader is referred to articles by Ferguson (49-51), Garth (64-70), Hunter (94), Peterson (151), Klineberg (105, 106), and others. For a more comprehensive survey of work done on estimating racial intelligence, making comparisons, weighing complicating factors, and deducing inferences, the reader is referred to recent survey publications by Garth (69, 70).

Here again much research remains to be done on possible modifications in the development of intelligence of different races, with the introduction of different environmental variables, and the length of time in which such factors have had a chance to operate.

## SUMMARY OF RESEMBLANCES OF VARIOUSLY RELATED GROUPS

Classifying groups according to genetic association, we find a hierarchy of relatedness: Identical twins; fraternal twins and other siblings; parents-children, lesser related groups, such as cousins, *etc.*

TABLE 45

COEFFICIENTS OF CORRELATION FOR INTELLECTUAL RESEMBLANCE AMONG GROUPS  
EXHIBITING DIFFERENT DEGREES OF GENETIC RELATIONSHIP \*

Group	r
Physically identical twins.....	.90
Like-sex twins .....	.82
Fraternal twins .....	.70
Unlike-sex twins .....	.59
Siblings .....	.50
Parent and child .....	.31
Cousins .....	.27
Grandparent and grandchild .....	.16
Unrelated children .....	.00

\* From Wingfield, 218.

Individuals, unrelated by blood, but springing from the same social status, tend to intermarry; whereas, unrelated individuals from different social strata are less likely to intermarry. A certain mental resemblance is to be noted among "socially related" groups; and a certain dissimilarity among "socially distant" groups.

It must also be noted that there is a tendency for environment to vary directly as the hereditary relationship varies, in that tradition supplies as nearly an identical environment as possible for identical twins, including clothes, recreation, schooling, social, even occupational pursuits, parental attitudes, and so on. Sibs, from two to four years apart, are usually reared in the same home and under

the same general conditions. To a lesser extent parents and children share similar circumstances, at least those occurring during the lives of the offspring, although the conditions of the parental upbringing may vary markedly. Cousins and other family relatives live in different homes, but, in a measure, represent similar culture standards, resulting from the ideals of their more closely related parents. In the same way, unrelated individuals living in the same general region, or of the same social or economic level, represent similar standards and opportunities. Unrelated individuals of different social levels represent rather widely different opportunities for cultural acquisition and experience, protection against disease, accident, physical or psychological, and so on.

A method widely employed to study the effect of heredity on development of intelligence, has been to note the changes in degrees of intellectual resemblance, with changes in degrees of hereditary relationship; twins resembling each other more nearly; unrelated individuals more distantly. The fallacy, however, is that hereditary closeness is usually concurrent with an equal degree of environmental resemblance. Are twins alike because of their homologous ancestry, or because of their almost identical upbringing?

The argument then follows, therefore, that the coefficient of resemblance depends for its size as much on environmental influence as on closeness of genetic relationship, that the figures in themselves tell little or nothing as to how much influence environment (or heredity) has in determining these resemblances. The chief value of these figures to the experimental worker is that they serve as bases against which to measure the influence of a *change* in environment, when such a change is experimentally introduced.

For instance, if under similar conditions of culture, identical twins resemble each other to a .9 degree, how much will they resemble each other when they are brought up under dissimilar conditions, *i.e.*, separated in infancy, and allowed to develop in different cultural levels? A difference in the two figures would attest to the direct effect of the difference in cultural environment. Again, siblings reared together are known to resemble each other to the extent of a .5 correlation; if the siblings are separated in infancy, and allowed to develop in different cultural media, will this figure change? Similarly for parent-child and other related individuals; similarly for matched social groups?

Since, however, the mere fact of separating twins, siblings and cousins, and other equated Subjects, is only one element in the situation, separation is in itself not enough. Effort must be made to

place members of any pair in *different* cultural milieus; devices must be secured for measuring the factors of the environment which can be considered to have an effect on the development of intelligence, and the *extent of intra-pair* differences must be correlated with the *extent of environmental difference*.

*iii. Mental Resemblance between Individuals or Groups When Environment Has Been Changed for One Member of a Pair*

EXPERIMENTAL STUDIES ON SIBS REARED APART

Let us repeat again, at the risk of boredom, that studies of how much sibs resemble each other do not in themselves contribute any information as to whether this resemblance is due more to similar hereditary background or to the influence of common environmental factors, which are conceded to be approximately equivalent for children near in age and reared within the same home. If, however, the environment for one sib is changed, and he is reared in a home quite different from that in which his mate is reared, and if after a period of years the sibs are found to resemble each other to about the same degree as before separation, it is apparent that the environmental factors were relatively powerless to make sibs different; or, in other words, to account for the resemblance between them. If, on the other hand, the resemblance of sibs separated into dissimilar environments is found to be quite different from the pre-separation resemblance, then this change in measure of resemblance can be considered accounted for by the change in environment. The following research is concerned with this kind of experiment.

The siblings studied by Freeman, Holzinger, and Mitchell (125) were divided in two groups, according to whether or not the period of separation was spent continuously in one home, or whether the child was moved through several homes. The "Main Group" consisted of 185 children, separated from two to thirteen years, and living in different homes. The "Limited Group" consisted of 130 sibling pairs, representing sixty-four families who had lived continuously within the one home. This group was separated at least four years and on the average about seven years. The average age at which these children were separated was five years, four months.

Their intelligence was measured by standardized tests: (1) The Stanford-Binet, with corrections made to allow for an original inadequate standardization through the ages five to fourteen; (2) The International Group Mental Test which dispenses with



language. The environment into which the children were transferred was measured by a specially prepared blank which was filled out by the field worker who visited the home. This blank covered such points as: Material environment and evidence of culture within the home; education of foster father and mother; occupation of the foster father; and the kind of social activity indulged in by the foster parents.

The sibling data gathered were arranged in many different ways and with respect to many different factors in the environment. For detailed discussion the reader is referred to the original report. (125) Here only the most interesting conclusions will be summed up. Two types of correlations were computed by a double and single entry method, and for each factor studied. The correlations obtained are summarized in the following table.

TABLE 46  
CORRELATIONS BETWEEN THE INTELLIGENCE OF SIBLINGS WHO HAD BEEN  
SEPARATED AT LEAST FOUR YEARS \*

Method of Pairing †	Entire Group	Age at Placement		Length of Adoption		Type of Homes	
		Before Six Years of Age	After Five Yrs. of Age	More than Seven Yrs.	Less than Seven Yrs.	Unlike Homes	Like Homes
Age entry . . . .	.34±.05	.32±.09	.49±.08	.27±.08	.41±.07	.28±.08	.39±.07
Double entry . .	.25±.06	.25±.09	.43±.09	.21±.08	.23±.08	.19±.08	.30±.08
N . . . . .	125	46	38	66	59	63	62

\* From Freeman, 125, p. 130.

† Sibling correlations, like twin correlations, are different from ordinary correlations, where measures of two different traits are set down for every individual in a series. Here two *individuals* are measured with respect to the *one* trait. In the single or age entry method the score for the older member of the pair was tabulated in the same direction; while for the "double entry" method, every pair of scores was entered twice, thus producing a symmetrical table.

The data on separated siblings were also studied by the method of mean differences, and in respect to various factors for which correlation coefficients of resemblances are reported. The average I.Q.'s, set down in Table 47, force attention on quality of foster home. Freeman drew the conclusion that "improvement in intelligence is more dependent upon type of home than upon age of placement."

For siblings separated early, or placed in homes of different types, the coefficient of resemblance is seen to be generally lower than those usually obtained for siblings reared together, and reported in the previous studies which we have examined. (Summarized in Table 38, pp. 232-33)

TABLE 47

AVERAGE INTELLIGENCE QUOTIENTS OF TWO GROUPS OF SIBLINGS WHO HAD BEEN SEPARATED AT LEAST FOUR YEARS \*

Average of I.Q. of Sibs		Differences between Average I.Q.'s of Separated Sibs	Differences When Corrected for Inadequacies of Test
Placed in better homes	Placed in poorer homes		
95.0 $\pm$ .9	85.7 $\pm$ .8	9.3 $\pm$ 1.0	6 points
Younger when placed	Older when placed		
94.3 $\pm$ .9	86.4 $\pm$ .9	7.9 $\pm$ 1.0	3.8 $\pm$ 1.0
Older but placed in better home	Younger but in poorer home		
89.5 $\pm$ 1.5	87.7 $\pm$ 1.4	1.8	5.2 $\pm$ 1.5

\* Adapted from Freeman, 125, p. 132f.

Freeman's general conclusions from his statistical findings were "that a part of the resemblance between siblings reared together is due to the influence of a common environment." He also concluded that since he could find no evidence of selective placement for his sibs (that is, a tendency to put the brighter child in the brighter home, and the duller child in the poorer home), and since random placement should produce two groups of equal intelligence after the period of separation, that "the superior intelligence of the siblings in the better homes appears, therefore, to give evidence that the character of the home affects the child's intelligence to a marked degree," and hence emphasizes the effect of environment in influencing the I.Q.\*

To render even more secure the position that there was no selective placement for these children, Burks (125) refers to a later analysis of Freeman's data which eliminated the factor of racial matching by dropping the Negro children from Freeman's 125 pairs of siblings and retaining sixty-three pairs whose ages ran between five and fourteen years. This restriction ruled out those cases who were tested at the less valid ends of the Stanford-Binet Scale, and also ruled out the factor of racial selection. For this restricted group a coefficient of  $.44 \pm .07$  was obtained which, as Burks notes, is not far from the general coefficient of .50, for siblings reared together. (p. 321)

\* A study later carried out by Leahy (114) under controlled conditions indicates a definite tendency on the part of placement agencies to "fit the child to the home."

## RESEMBLANCE BETWEEN PARENTS AND CHILDREN, WHEN THE CHILDREN HAVE BEEN REARED AWAY FROM THE PARENTS

Consideration will now be given to a possible change in the measure of mental resemblance found between parents and children, when the latter have been reared away from their parents. Will the change in environment for the child alter the general parent-child correlations, as found in earlier studies? (Reported on page 236)

The ideal experiment would call for mental test records on the parents and mental test records on their own children, placed or adopted into homes that are different, either better or worse, than the homes in which the natural parents themselves live. A measuring scale of homes would be a *sine qua non*.

Obviously it is not easy to set up an experiment in which parents can be measured and their children then removed to another home. But something approaching this set-up obtains in the case of illegitimate children who have never lived with their natural fathers and who have been removed from their mothers at birth or early infancy and placed in an institution or boarding home, or adopted out. Although in such a case the father's I.Q. is not generally obtainable, information as to his occupation is nearly always on hand. The average I.Q. levels for various occupations is also known, so that an approximate I.Q. can be assigned to the absent father. (See page 242) If children of these fathers are placed in a uniform environment, will they tend to "revert to type," as it were? That is, will the children of professional men reveal an I.Q. roughly approximate to that of their fathers? In other words, will the parent-child correlations of such a separated group differ materially from the parent-child correlations reported in our summary of previous investigations?

Such a study has been reported by Lawrence (113) in England. Lawrence tested children in a home for illegitimate children who had been given up soon after birth, and who had been brought up in a good, but uniform, institutional environment. Lawrence's findings of a positive correlation between these children and the occupational averages of their fathers are set down in tabular form below. Children of merchants and professional men averaged 101.5 I.Q., while children of laborers averaged only 92 (Stanford-Binet), although both groups had had the same institutional advantages, and neither had had contact with their parents. This difference is almost as large as that found among school children at large, living



with their parents, and having the advantage of cultural contact with their parents.

TABLE 48

DISTRIBUTION OF CHILDREN'S I.Q.'S ACCORDING TO AVERAGE SOCIAL RATING GIVEN TO PARENTS FROM WHOM THEY HAVE BEEN SEPARATED SINCE INFANCY.

AVERAGE OF BINET AND SIMPLEX GROUP TESTS \*

Mid Parent Class	Boys Mean I.Q.	N	Girls Mean I.Q.	N	All
A .....	99.0	4	105.0	1	100.2
B .....	104.2	15	100.06	18	102.13
C .....	101.1	41	97.08	25	99.09
D .....	96.48	23	92.76	25	94.62
E .....	98.0	1	—	—	—
		84		69	

\* From Lawrence, 113, p. 31.

In addition to the above analysis, a comparison was obtained by testing children in London schools, who were living with their parents. These London elementary school pupils, to whom the "Simplex Test" \* of intelligence had been given, were used as a control group. In this control group, children of the upper vocational groups averaged 105.5, and in the lowest of five groups the average was 96.29.

Expressed in terms of correlation ratios, the coefficient between social class of birth (father's occupation) and I.Q. of child was (a) for the babies reared in the institution .24 (average of boys and girls); (b) for the elementary school children living in own homes with their parents .24 (average of boys and girls). There was a slightly greater variability among the latter group.

Lawrence summarizes her findings thus:

"It remains true, however, that nowhere is the difference between the average intelligence levels of the five classes as great in the institution as in the elementary school children." (p. 32)

"What finally emerges from this part of the work is that though a child has never lived with its parents, it is likely, other things being equal, to have a slightly higher intelligence if it comes from one of the so-called upper classes, than if it is the child of labouring people." (p. 32)

An earlier attempt to see how far differences found among children at large are maintained when these children are removed from their homes to a common (institutional) environment was reported in 1927 by Jones and Carr-Saunders. (97)

The previous social classification of the children was determined

\* A test standardized in England.

by grading them according to a five-step classification (adopted by the Register-General of 1911) of the occupations of their fathers. Three general groups were arrived at. The highest (combining groups 1 and 2) were professional and clerical; the middle group (3) covered skilled manual workers; while the lowest group (4 and 5 combined) included unskilled labor. (See Table 49.) The Subjects were children in residence at eight different schools, two of which were industrial schools for boys, and one (H) catering to a higher social class. The Simplex test of intelligence was the rating employed.

Mean I.Q.'s were computed for groups, divided according to length of residence, and according to the former occupational class of the fathers. A separate distribution was made for children over ten and one-half years, who had been in residence for three years or more. Various arrangements were made of the above data for separate schools and for all schools combined.

Conclusions reached, set down also in tabular form, are summed up as follows:

TABLE 49

MEAN I.Q.'S OF CHILDREN BETWEEN NINE AND ONE-HALF AND FOURTEEN YEARS  
ACCORDING TO YEARS OF RESIDENCE AND OCCUPATION CLASS \*

School	Years of Residence (0-3)						Years of Residence (3-n)					
	Occupation Class						Occupation Class					
	1 & 2		3		4 & 5		1 & 2		3		4 & 5	
	No.	I.Q.	No.	I.Q.	No.	I.Q.	No.	I.Q.	No.	I.Q.	No.	I.Q.
A	54	101	47	100	66	97	6	—	8	—	9	99
B	9	105	7	—	57	96	15	94	17	102	48	97
C	—	—	9	91	11	95	11	101	8	—	16	95
D	4	—	12	87	36	84	—	—	2	—	6	—
E	1	—	10	96	41	95	3	—	4	—	43	96
F	—	—	—	—	—	—	—	—	2	—	9	92
G	—	—	4	—	10	98	—	—	2	—	2	—
H †	48	115	1	—	—	—	50	112	—	—	3	—
All	116	107	90	97	221	94	85	106	43	98	136	96

All Schools	Occupation Class						Occupation Class					
	Occupation Class						Occupation Class					
	1 & 2		3		4 & 5		1 & 2		3		4 & 5	
	No.	I.Q.	No.	I.Q.	No.	I.Q.	No.	I.Q.	No.	I.Q.	No.	I.Q.
	108	105	97		94	94	107	106	98		97	95
	107				94		106.5				96	

\* From Jones and Carr-Saunders, 97, p. 353.

† It will be noted that the high I.Q.'s in school H considerably weights Classes 1 & 2.

For children removed from their homes and placed in a uniform environment, the *original class differentiation of intelligence appears to hold*, the effect being present, both for the newcomers and for those in residence longer than three years. Children from lower occupational classes (three, four, five) tend to show higher I.Q.'s

after a period of residence; for children from the higher occupational classes (one and two) the effect is less marked, and in some cases reversed. As residence is longer, and as children become older there is less variability in intelligence, the mean I.Q. tending to increase from ages nine to twelve, and then to drop.

With continued residence, the average I.Q. of children from the upper social classes drops a point; the average I.Q. of children from the lower social classes goes up two points. These differences, however, cannot be considered significant, since they are well within the normal range. (See constancy of I.Q., p. 51 ff)

Both of the foregoing studies from England contribute this finding: That after removing children of known and varying heredity, the original individual differences among such children are maintained over a period of exposure to common stimulation, advantage, or training. For those whose original social level was poorer than the new, some slight increase is noted; for those whose original social level was higher than the new, a slight decrease is observed; the differences are very insignificant, but in either case, the order of rank is not changed; the children whose fathers were professional men continue to be brighter than the children of skilled manual workers, while the children of unskilled laborers continue to bring up the rear.

The contributions made by the Chicago study (125) on the effect of removal to another home as it bears on parent-child resemblance in intelligence do not point to so clear an answer. These investigators, too, were handicapped in not having measures of the true parents' intelligence. However, an approximation was reached, in that almost all of the parents were represented in the case histories which included information by neighbors, probation officers, ministers, relatives, and the like, on the occupational status, education, and mental and moral characteristics of the parents concerned.

The data which would shed light on the intelligence of children in relation to their own parents were arranged in various ways.\* In cases where one parent was known to be defective, the average I.Q. of the children adopted out was later ascertained as 92.9, and for those cases where both parents had been defective, the average I.Q. was 81.2. Children removed from their parents at an early age were compared with children removed when older. The results are assembled in Table 50.

Direct correlations are not possible but the above data suggest that all three factors are important in determining child intelli-

\* The reader is referred also to our discussion on page 257.



TABLE 50

I.Q.'S OF CHILDREN REMOVED FROM OWN TO FOSTER HOMES \*

	Average I.Q. for Children Removed Before Five Years of Age	Average I.Q. for Children Removed After Five Years of Age	Total N
Having one defective parent.....	95.1	87.2	120
Having two defective parents.....	86.0	78.1	26

\* Adapted from Freeman, 125, p. 165.

gence: namely, parental intelligence, removal to a better foster home, and age at time of transfer. However, from the above data no inference can be drawn that one factor is more or less important than any other.

#### INFLUENCE ON GROUPS (OF KNOWN SOCIAL ORIGIN) OF CHANGE TO SUPERIOR HOME

We have presented comparative data on: Twins reared together and apart; siblings reared together and apart; parents and children living together and separated; and have noted that in the natural or untampered situation—of these genetic groups living together—resemblances could be attributed to both nature and nurture influences, whereas in the situations where genetically related groups have been reared apart, the resemblance can be attributed to nature alone. (Unless, indeed, the separated environments were so closely similar as to yield approximately the same opportunities or hindrances to development. This bespeaks the great need for an adequate measure of “environment.”)

To repeat, we have presented studies showing the resemblance which can reasonably be expected to obtain for various degrees of genetic relationship, and studies which attempt to show any alterations which may take place in these relationships when certain environmental variables have been introduced. We shall now present but a very few studies to show what happens when social levels have been tampered with; that is, when some change in the cultural level has been introduced. When children in developmental ages have been transferred from one level to another, will the original levels of I.Q. hold, or will they resemble more the new levels? These studies have significance in determining what contributions cultural and economic environment can make in modifying the I.Q.

Terman (125) states what would be the ideal experiment of this sort:

"From several hundred families of the grade whose offspring ordinarily yield a mean I.Q. of 80 (say families of low-grade unskilled laborers), take 500 children as soon as they are born, and after subjecting them to ten years of superior educational and cultural influence, compare their I.Q.'s with those of 500 other children from the same families who have not had these advantages. The mean I.Q. difference found would measure the combined effect of the environmental opportunities enjoyed by one group and denied to the other." (p. 29)

Equally necessary for measuring objectively the influence of improved cultural background is it to have a measure of the children's intelligence before the experiment is made; a measure of the home previously lived in; a measure of the new home; and a measure of the I.Q. after living in the new home over a period of time—sufficiently long for modifying influences to have had a chance to operate.

#### REMOVAL TO AN INSTITUTION OF THE BETTER SORT

Rogers, Durling and McBride (125), employing the test-retest technique, sought to estimate the effect of a good institutional environment as opposed to a most unfavorable original home background. Their Subjects were sixty-four girls of native American stock, ages from four to thirteen years, who had been committed from "extremely poor social and educational conditions" to an institution run on the cottage community plan and aiming to provide the kind of social experience which a child would receive in an excellent family. The original home environment was graded by Terman's definition of "unfavorable" which lists such influences as "excessive indulgence, one or both parents dead, parents divorced, imperfect parental control, unsuitable companions, undue severity, child obliged to care for home, child has to look after self, left to care of nurse, family below average mentality."

The period of institutional residence ranged from one-half to five and one-half years and averaged one and one-half years, so that the time interval between tests was not uniform for all. The gains or losses in I.Q. were distributed and compared with the individual changes recorded for a control group of public school children who had not changed residence. (a) The test-retest correlation (Stanford-Binet I.Q.'s) for the two groups was  $r = .78 \pm .04$  and  $r = .89 \pm .05$ . (b) It was also determined that the inter-test difference was within ten points for eighty-one per cent of the combined group, while for the middle fifty per cent the inter-test

differences ranged between three points increase to six points decrease. This is compared with Terman's results 5.7 points increase and 3.3 points decrease as normal expectancy. (See also discussion on constancy of the I.Q. pp. 51 ff.) The authors conclude:

"Under superior testing conditions the intelligence quotients of these two groups of sixty-four girls shows no change beyond what could occur by chance, in spite of an extreme modification of environment." (p. 331)

Lawrence (113) has also contributed data on change to an improved home. From among her institution cases, those children who came from notoriously bad homes—children of insane, drunken or criminal parents, forming the bulk—were grouped according to the proportion of their lives spent in the institution—an improved environment. Results (a) by averages are set down in the table below:

TABLE 51  
INTELLIGENCE OF CHILDREN AND PROPORTION OF LIFE IN INSTITUTIONAL HOMES \*  
(Simplex Test)

Group	Boys		Girls	
	Mean I.Q.	No.	Mean I.Q.	No.
A .....	92.64	45	93.64	39
B .....	93.08	49	91.18	32
C .....	96.79	43	96.41	39
D .....	93.46	24	91.4	22
Correlation Ratios		Boys $\eta = 0.12 \pm .05$		
		Girls $\eta = 0.17 \pm .06$		

A—Less than one-fifth of life in institution. B—Between one and two fifths. C—Two to three fifths. D—Three-fifths and over in the institution.

\* From Lawrence, 113, p. 39.

The above results do not show improvement for the longer proportion of residence in the improved environment.

In a different analysis Lawrence found that children living with their parents tended to show a slightly closer resemblance on the Simplex test as they advanced from age eleven to age fourteen. Coefficients rose from .26 to .41; whereas for children in the institution this rise was much smaller, the rise being from 21.5 to 26.

Very recently, Lithauer and Klineberg (116) report a mean improvement of 5.9 points on Stanford-Binet I.Q. for a group of 120 orphanage children, aged three to thirteen on entering the institution, or when placed in foster homes. The middle fifty per cent of change with improved environment fell between  $-0.3$  and  $+11.8$  points as compared with Terman's limits of  $-3.3$  to  $+5.7$  points.



## CHILDREN ADOPTED INTO BETTER HOMES

Freeman (125) reports on a group of 74 children adopted into private homes. These children took a test at the average of eight years, and a later test at average age of twelve years and two months. The first tests do not correspond exactly with the age of placement, which was much younger. The average I.Q. on the first test was 91.2, and on the second testing was 93.7, a difference of  $2.5 \pm .8$ , which is barely significant. However, the homes into which the children went did not represent the best (a pronounced change); nor did the children chance to be there during the earlier and more formative years of their life. When his data on this group are reclassified, Freeman finds that for the younger group who spent years six to ten in a foster home, the gain was 5.2 points in I.Q. For the older group, who spent years ten to fourteen, there was a loss in I.Q. When divided according to quality of homes, there was a positive correlation of  $.52 \pm .06$ , which means that the higher grade child tended to be connected with the higher grade home. Before placement this was computed as  $.34 \pm .07$ , showing some selection of child to home. The difference he attributes to the influence of the new home.

For 134 other children who have been given a test before adoption, he reports a gain of .8 point which was raised to 5.6 points I.Q. when correction was made for test weakness. Reclassification into three sub-groups shows a gain for Group I (7.5 points) for those children who remained within the one home during the adoptive period. For children who were shifted around the gain was negligible.

A second block of material from Freeman's project consists of those children whose pre-adoptive intelligence, though not tested, could be adequately estimated on the basis of family, especially parental records. He sets down individual data which cannot be reproduced here, but in general the congenital ability is very low. The interesting observation which must be recorded is that the I.Q.'s of these children after a period of adoption were distinctly higher than the estimated I.Q. of their parents. Two factors could account for this: The regression of offspring toward the mean, and the influence of improved home in elevating the I.Q. of the children. The whole committed group averaged 95.3, the illegitimate registering higher (103.7) than the legitimate group (91.5).\*

\* Legitimate parents give up their children because of intellectual and economic inadequacies; illegitimate parents give up their children in general for conventional

These are higher averages than birth led to expect and Freeman stresses the environmental factor.

Freeman also compared his committed group who had lived in foster homes with a new group awaiting commitment, on the assumption that there was no inherent native difference between the two sets of children. The group already placed averaged  $94.1 \pm .6$ , while those on the waiting list averaged  $88.6 \pm .8$ . He comments:

"If it could be assumed that the Newly Committed Group and the Home Group had the same type of heredity and early environment, the observed differences in intelligence would have to be ascribed to the improved surroundings of the members of the Home Group." (p. 160)

Freeman also presents findings to show that the earlier these under-privileged children are placed, the higher is the resulting I.Q. after a period of residence in the better home. Distributed according to age of commitment he gets the following averages:

TABLE 52

AVERAGE I.Q. OF ADOPTED CHILDREN GROUPED ACCORDING TO AGE OF ADOPTION \*

	Legitimate		Illegitimate		Total
	N	Avg. I.Q.	N	Avg. I.Q.	
Before two years .....	(55)	95.2	(20)	105.1	102.0
From two to five years.....	(96)	97.1	(21)	102.5	98.1
After five years .....	(183)	87.7	(—)	—	87.7
Total .....					95.3

\* Taken from Freeman, *et al.*, 125, p. 196.

Lawrence (113) includes an analysis of data to show the effect of *age of leaving* the parents in altering the relationship between child's I.Q. and social grading of the home from which it came. The groups were small when divided for those admitted before age of three and those admitted after three into an institution. (a) On the Stanford-Binet the highest occupational group of five averaged (for the early age admission) 109.3, while the lowest averaged 98.5; and for the later admissions the Class A Group averaged 111.1, and the Class E Group 89.7. (b) Expressed in correlation ratios the average coefficient for the first group was .31; for the late leavers .47 (between I.Q. and native social status.)

It is difficult to draw conclusions from the above other than that the age of leaving home to enter an institution appears to be

reasons, rather than intellectual limitations. Here again, parental mental level is relatively maintained in the offspring, as well as beneficent influence of home.

more significant for children of poorer economic levels than for the children of the upper classes.

Burks (125), in California, also studied the post-adoption intelligence of foster children. Before drawing conclusions she assembled evidence to show that homes were not matched to the foster children by comparing occupations of true parents with occupations of foster parents, as rated on the Barr scale. Her obtained coefficient of correlation was zero and negative. Other criteria were rigidly examined on the basis of available data on the status of the true parents.

Upon the basis of these somewhat empirical considerations, she estimated that the "congenital mental level" of her adopted children was "not more than two or three points above 100 I.Q." The average I.Q. actually obtained on her 214 children, aged five to fourteen, all adopted before a year old, was 107, an insignificant increase, as that figure falls rather closely within the normal range of variation on test-retest records. (See p. 52.) The average mental level of the foster parents of these children, however, was as much as one standard deviation above the general average of parents (which, converted into per cents, means that 84.13 per cent of the true parents would rank below the average of the foster parents).

Burks examined other separate environmental variables, such as Home and Culture Rating, for their possible influence on mental development, and concluded:

1. "The total effect of environmental factors one standard deviation up or down the scale is only six points, or . . . the maximal effect almost certainly lies between three and nine points."

2. "Assuming the best possible environment to be three standard deviations above the mean of the population (which, if environments are distributed approximately according to the normal law, would only occur about once in a thousand cases), the excess in such a situation of a child's I.Q. over his inherited level would lie between nine and twenty-seven points—or less if the relation of culture to I.Q. is curvilinear on the upper levels, as it well might be." (p. 307)

## B. HEREDITY VARIED, ENVIRONMENT SIMILAR

### *i. Mental Resemblance Found Among Unrelated Children Reared Together*

The foregoing studies have reported the effect which a *change in environment* can make on genetically related groups of various orders, or on a group whose congenital intelligence is known. The following studies will report on the effect which a constant or



*uniform environment* can make on individuals brought up together, but differing in heredity.

In this approach we are not so much concerned with the resemblance between these children and their original parents (as reported in the Lawrence (113) and Jones-Carr-Saunders (97) studies), or with their resemblance to original social levels, as we are with what a "common environment," "equivalent opportunities of home culture and training" may do in making unrelated people alike. In other words, heredity is varied, and environment is held constant for a number of individuals.

Studies on the mental level of orphanage children find that, although the average I.Q. is lower than for the generality of children, nevertheless, there is always a range of ability attesting to the fact of individual differences, according to the normal curve of distribution. (See Gordon (80), Hildreth (84), Davis (33), Jones and Carr-Saunders (97), Wingfield (218-220) *etc.* This variability of I.Q. in a uniform environment is logically attributed to variable hereditary endowment. Several writers have attempted by one means or another to match unrelated orphanage children at random, or according to some specified system of matching, and have reported results on resemblances or differences between these mated children.

#### INSTITUTION STUDIES

Hildreth (84) studied ninety-four unrelated children living in an orphanage for from fifty to one hundred per cent of their lives and compared the standard deviation within the group (that is, their variability) with the standard deviation of unrelated children reared apart. A comparison of these standard deviations did not indicate any closer resemblances among these orphan children than among unrelated children brought up in varied environments.

Davis (33) was interested not only in comparing sib resemblance with unrelated mate resemblance in an orphanage, but also to probe the problem of the effect of length of residence in the orphanage and its possible effect on intelligence. He divided both his sibling and his unrelated groups into three sections according to their length of stay in the home, and according to their age of entrance into it, and found zero correlations in every case for the unrelated children; that is, there was no tendency for individuals to become alike with continued residence. When he paired children at random from the public school population, he found also that there was no resemblance between them.

Wingfield (218-220), studying only fifteen pairs of orphans, by two methods of pairing (random and by age) found also that unrelated children reared in a uniform environment show no closer resemblance than unrelated children reared apart.

If environment is especially potent to affect intelligence scores we might expect that children reared together would tend to be more alike within the group than children at large; that the range of a group of individual differences (variability, spread, *etc.*), would be less than for similar groups reared in separate homes. One way to express range is by the "coefficient of variation." \*

Lawrence (113) compared the coefficients of variation for her institution children (reared there since infancy) and for children of the London elementary school and found the following:

TABLE 53  
C.V.'S IN TEST INTELLIGENCE OF CHILDREN REARED TOGETHER AND CHILDREN REARED APART \*

	Boys	Girls
Institution .....	13.93	12.94
Elementary School .....	15.39	14.04

\* From Lawrence, 113, p. 40.

Variabilities for the different ages of the institution children were compared with variabilities for similar ages outside and found not to be noticeably different. Burt (20, p. 158) had noted earlier that the Stanford-Binet test on children in elementary school decreased in variability after age ten; up to ten the spread was relatively constant from year to year. This change he attributed to defective standardization of the tests. This point must be borne in mind when variability is noticed among children reared in institutions, lest inferences on decrease be attributed to the fact of common living as Jones and Carr-Saunders (97) intimated in their study (p. 359).

Environment Controlled by Matching Homes

Sims (180) *selected* his unrelated children according to cultural standing of their families (*i.e.*, keeping environment constant). But it is well known that I.Q. varies with different cultural levels, and it follows that Sims has also selected children of *similar intelligence* on the basis of a criterion known to correlate highly with intelli-

\* Pearson's formula  $V = \frac{100 \sigma}{\text{Average}}$  compares the *relative* variability of two groups by taking account both of the central tendency and the variability of different kinds of groups. (63, p. 41)

gence. When matched for age, school attended, and cultural standing of the home, the coefficient of mental resemblance was  $r = .38$ . When children were paired with unrelated children of the same age, but with home background disregarded, the coefficient was  $.05 \pm .05$ . This last result is quite consistent with the findings of other investigators on the mental resemblance between unrelated children, and between "unselected" children. Selection by cultural level is *a priori* a selection according to intelligence level, and it is not surprising therefore to find a positive coefficient any more than it would be if the investigator selected according to any other factor known to correlate with intelligence, such as age-grade placement, rank in school class, achievement, etc. Sims' findings contribute nothing new as to the *degree* to which social culture is responsible for size of I.Q. (apart from similar mental equipment to begin with).

### Foster Homes

#### (i) Foster-sibling Studies

#### (ii) Foster-parent—Foster-child Studies

We come now to another group of studies concerned with the intellectual resemblance of unrelated individuals, exposed to the same educational and cultural advantages over a period of mental development. The studies to be presented here differ from the immediately preceding group, in that no large group of unrelated individuals is to be found in any one uniform environment, as was the case with orphanage residents. Here we are concerned with studying the mental ability of foster children in a private home and comparing this ability with that of other individuals in the same home—foster sibs, foster parents, *etc.* The amount of foster resemblance can be compared with that found for: (1) Unrelated children in unselected homes, (2) true siblings in their own homes. In some cases one of the foster sibs may be the natural child of the rearing parent; in other cases both foster siblings may be unrelated by blood to the parent. Another set of data is to be found in a comparison of the foster parent and foster child with "true parent," "true progeny" mental resemblance (already discussed).

The basic assumption in foster-sibling and foster-parent—foster-child studies is that there was no selective placement, that is, no effort had been made to match the child to the home into which he was to be placed. If there is any tendency to "fit the home to the child" or to match social origins, then any resemblance found



after a period of residence in the foster home obviously cannot be credited to the influence of the home alone (*Cf.* criticism on Sims' selection factor, page 261 f.) As shown before, a purely chance assembling of unrelated children yields a zero correlation for mental resemblance. If there is a positive correlation before placement between natural child and adopted child, or between two prospective fosterlings, then such a correlation would be evidence of "selective placement," consciously or unconsciously exerted. Freeman and his workers sought to throw light on this matter by investigating the attitudes and specifications of foster parents at the time of making application for a child. Freeman's survey showed that parents tended to stress such details as: Appearance and sex of child, age, nationality, health, conduct, and items of personal attractiveness, and that the intelligence of the child was not usually considered as a factor in adoption.\* Most of the children had been placed in the days when a religious rather than a social service point of view dominated the placement. Furthermore, these workers maintained that matching could not have been made, for in many cases it was almost impossible to estimate the intelligence of the child to be placed; *e.g.*, he was too young; had not yet earned school grades; too little was known about his parents; and there was no adequate basis for estimate. Even in the case of other children for whom it was easier to calculate their degree of intelligence, apparently no advantage had been taken. The correlation with Home Rating for the easily judged children was no higher after adoption than for the children whose pre-adoption ability had not been known. The racial factor was also allowed for in the adoptive process, but an analysis of the material indicates that selection according to race did not affect the observed correlations.

However, quantitative studies can also be reported, since there were available a number of mental test records of children, tested *before* adoption. These pre-adoption I.Q.'s were correlated with the Home Rating scores of the homes into which the children went, with a resulting coefficient of .34, indicating some selective placement or resemblance between mental calibre of parents and children to be adopted. Indeed, this coefficient of .34 is almost identical with the coefficients reported by other investigators on true parent-child resemblance. It appears, therefore, that some unconscious matching must have taken place. This point should be borne in mind in interpreting the following findings:

\* One wonders how long it will be before foster parents safeguard themselves against later disappointment in their wards by availing themselves of the services of a psychologist at the time of choice.

*ii. Foster-Sibling Resemblance*

In comparing foster children with own children, Freeman, *et al* (125) note that whereas the own children had been in the homes since birth, the foster children had entered on the average at four years, eight months, and had lived in the foster home on an average of six years and nine months at the time of the survey. (a) The average I.Q. of own children was  $112.4 \pm 1.6$ ; that of the foster children  $95.1 \pm 1.7$ ; while those foster children who had entered the home before three years of age, averaged 99.9. (b) Expressed in terms of correlation, the coefficient between forty pairs of own children and their foster sibs was  $.34 \pm .09$ .

Another group consists of those fosterlings, all of whom were adopted in the home. The resemblance for these seventy-two pairs of foster-foster sibs was  $.37 \pm .07$ .

When all children were combined into one group (112 pairs), correlations were from  $.25 \pm .06$  (double entry) to  $.31 \pm .06$  (age entry) on Binet I.Q.'s. On the International Test fifty-six pairs resembled each other about the same, *i.e.*,  $r = .27 \pm .08$ .

Combined with data supplied by Terman, Freeman *et al.*, obtained the following coefficients of relation:

Intelligence of foster with own children	.38 (N = 47)
Intelligence of two foster in same home	.40 (N = 93)
Intelligence of two unrelated in same home	.34 (N = 140)

Freeman *et al.*, comment:

"In conclusion, it should be noted that there was probably some tendency for two children of similar mental ability to be placed in the same foster home. If such selection did not exist the expected correlation between the intelligence of the two children at the time of their adoption would be zero. It would still be zero after several years of residence in the same home unless the intelligence of the children was modified by the new environment. Since all of the observed correlation of .40 could hardly be due to selection, it is highly probable that such modification actually took place. The influence of environment, therefore, is shown by the fact that when two unrelated children are raised in the same home, differences in their intelligence tend to decrease." (p. 139)

*iii. Foster-Parent and Foster-Child Resemblance*

As stated on page 263, Freeman, *et al.*, (125) reported the correlation between Home Rating and intelligence. For those children tested before adoption the coefficient was .34; for those who were tested after a period of residence in the foster home, the coefficient

with Home Rating index was .52, suggesting that the second coefficient is higher because of the beneficent influence of the foster home. The coefficient between the children's I.Q. and the intelligence of the foster parents as tested by the Otis tests is .37. This correlation is directly comparable with the pre-adoption relation between the child's I.Q. and his future home. It is also directly comparable with the usual coefficients found for true-parent—true-child resemblance.

It is difficult to draw from the above findings the conclusion that the character of the home is an important factor in developing the child's I.Q., since the pre-adoption coefficient of resemblance was of almost the same magnitude as the post-adoption coefficient.

On the other hand, the coefficient obtained for combination of heredity and culture is no higher than the coefficient obtained for culture and selection. This need not mean more than that in one case the similar degree of resemblance was due to biological \* selection, and in the other to unconscious, perhaps, but artificial selection.

In another place (p. 138) Freeman reported two sets of correlations: Between mid-parent score on the Otis test and true child I.Q. on the Binet, the coefficient was  $.35 \pm .11$  ( $N = 28$ ); between mid-parent score on Otis test and foster child I.Q. on Binet, the coefficient was  $.18 \pm .13$  ( $N = 26$ ) for thirty homes. Here he considers a difference of  $.17 \pm .14$  as insignificant.

Data reported above on relation of foster children to their foster parents are concerned with but thirty homes. Freeman has also made an analysis of a much larger group of cases, 401 in number, and has tried to compare the relationships between these children and their natural parents with the relationship between these same children and their subsequent foster parents. The correlation between the Home Rating as measured by his special blank and the I.Q.'s for the foster children was .48. The foster fathers themselves represent a clearly superior group of citizens when judged by their vocation, education, and vocabulary. The "own" parents, especially for the legitimate children, represent much lower levels of population in general when judged by family records; *e.g.*, thirty-six per cent of the children in this "Home Group" had had at least one natural parent defective; other parental stigmata were insanity, moral degeneracy, incidence of crime, prison record, *etc.* So that as a group the adopted children represented a much

\**I.e.*, that tendency referred to in preceding pages for the I.Q.'s of children to match the social level into which they are born.



poorer genetic selection than did their foster parents; and as a group their level of intelligence quotients averaged  $97.5 \pm .6$ ; lower indeed than the estimated level of the foster parents; lower also than Terman's average of  $101.5 \pm .3$  for an unselected population.

However, this does not answer the question as to how much agreement there was between the intelligence of children and foster parentage within each home. Freeman was able to secure test data for a group of the foster fathers and mothers and reported coefficients as follows:

TABLE 54

CORRELATION OF CHILD'S BINET I.Q. AND FOSTER PARENT'S SCORE ON OTIS INTELLIGENCE TEST \*

	Coefficient	P.E.	N
Foster father and child.....	.37	.04	180
Foster mother and child.....	.28	.04	255
Average of both foster parents and child.....	.39	.04	169
Child Score on International Test (age held constant) and Mid-parent Otis score.....	.16	.06	120

\* Data from Freeman, *et al.*, 125, p. 177f.

Data were also arranged to show the intelligence of children according to the occupational status of the foster fathers. These data are studied both by the method of group averages, (125, p. 178) and by correlations; this latter relationship is expressed in the coefficient of  $.37 \pm .03$ . Clearly also the averages of the children moved up with the rising quality of the material environment, for the coefficient between the child's I.Q. and the "personal rating" of the foster parents is  $.49 \pm .03$ ; between the child's I.Q. and the education of his foster parents, the coefficient is  $.42 \pm .03$ .

Of course these figures would mean very little if the child had been "matched" to the home before he was placed in it. Freeman offers a discussion of this selective factor in placement (see also page 264 of this book) and presents evidence which would indicate that some general selection did exist, but not sufficient, he thinks, to account entirely for the close relationship above reported. He concludes that this foster-parent—foster-child resemblance is in large part a result of the character of the environment.

Burks' analysis of her cases is concerned with the foster-parent—foster-child relationship, a familial resemblance which would be dependent on nurture influences alone. Burks approaches her problem from many different angles. Her tools of measurement consisted of the following: The Stanford-Binet mental test given to both parents and children; a personal information blank filled out by the foster parent, and certain data in regard to the child's own

parentage, age of adoption, national descent, *etc.* Her 214 foster children were selected from the files of two California child placement agencies on the basis of the following criteria: (1) The child was adopted when under one year of age; (2) the adoption was legal; (3) the age at time of study was between five and fourteen; (4) the foster parents were American, or North European born; (5) the same was required of the true parents; (6) both foster parents were living together; and (7) the home was accessible to the three chief coast cities. The children lived in urban towns and rural districts.

Some of Burks' tables are set down to show her different modes of attacking the problem. Perhaps the one computation of most interest at present is her coefficient of  $.20 \pm .05$  between the mental age of the foster mid-parent and the I.Q. of the child, for 174 pairs. This coefficient she contrasts with her study of the true-parent—true-child relationship giving a coefficient of  $.52 \pm .05$  for 100 carefully matched cases. (125, p. 319)

Expressed in terms of averages, comparison (between the intelligence of foster children and children born into the level of the foster homes) is as follows:

The average I.Q. of foster children was 107.4.

The average I.Q. of own children in control was 115.4.

Difference of eight points or more is evidently due to heredity.

Another coefficient of special interest is that presenting the relationship between child's I.Q. and the quality of his foster home, as measured by the "Culture" index and the Whittier index. This multiple coefficient for environment and I.Q. is  $.35 \pm .05$ . Burks contrasts this with the coefficients of the Chicago study which were  $.34 \pm .07$  ( $N=74$ ) before placement, and  $.47 \pm .03$  ( $N=304$ ) and  $.52 \pm .04$  ( $N=156$ ), *etc.*, after at least four years' residence in the foster home. Burks comments that the higher Chicago coefficient is due to a greater degree of selective placement (as evidenced in correlation before adoption) and statistically computes what the Chicago coefficient would have been if selection had not operated. She finds a coefficient of .39 which compares favorably with her multiple coefficient of .35. This would be a fair measure of the effect of nurture influences alone when nature contributions do not affect the relationship. (125, pp. 319-20)

A slightly different attack on the data was Burks' study of her foster children from the standpoint of *variability* in score. Based on knowledge of facts concerning their parentage, the expected average I.Q.'s to be found in the children would be "not more than

two or three points above 100 I.Q." (p. 304) When these children were placed in homes of superior advantage, the *range* as well as the *average* increased. I.Q.'s as high as 160, and as low as forty are reported. In other words, heredity permitted a spread of about 120 points within the group. If the higher I.Q. children had been reared in their original social levels their full potentiality would never have been developed. Placed in an *extremely favorable* home, the child's native possibilities were trained, probably to their full extent, and the uppermost limit of development was reached. Considering her data from the standpoint of variability, Burks says:

"Home environment contributes about seventeen per cent of the variance in I.Q.: parental intelligence alone accounts for about thirty-three per cent.

"The total contribution of heredity (i.e., of innate and heritable factors) is probably not far from seventy-five or eighty per cent." (p. 308)

It is perhaps unfair to give such a quotation without other context, but it is of particular interest because of the desire of one worker to place an actual measure on the relative importance of each.

#### *iv. Summary on Influences of Similar Environments*

By way of summary, may we point out that two lines of approach have been followed in our discussion: (1) Evidence has been submitted, generally by way of correlation coefficients, to the effect that the closer the kinship of two or more individuals the greater the resemblance likely to be found between them. (2) Using these coefficients as a base or check, resemblance has been studied for the same degrees of kinship when the members of the pair have been separated and reared in different environments. (3) A third procedure has been to compare the resemblance of unrelated individuals, reared together, and reared apart. The bulk of our discussion has been given to the second approach, since this is presumably the best technique for determining the influences of cultural environment (apart from heredity), in making for such mental resemblances as are usually found among relatives.

Table 55 tabulates in summary the spread of intra-pair differences to be found among pairs, related in decreasing degrees of kinship. It also shows the distribution of differences when "environment" has been changed for one of the mates in each relationship. Figs. 25 and 26 bring out the same points.



Data have been included on test-retest differences for individuals who took two or more tests at different times; on differences in I.Q.'s of siblings who have been reared together, and similar data for siblings reared apart; and data on unrelated orphanage children reared together in an institution for from 30 to 100 per cent of their lives (Hildreth); and unrelated children reared each in their own homes. The latter were selected at random from Dr. Hildreth's raw data, which were kindly placed at the disposal of the writer.

TABLE 55

DISTRIBUTION OF INTRA-PAIR DIFFERENCES IN I.Q. FOR VARIOUS GENETIC GROUPINGS \*

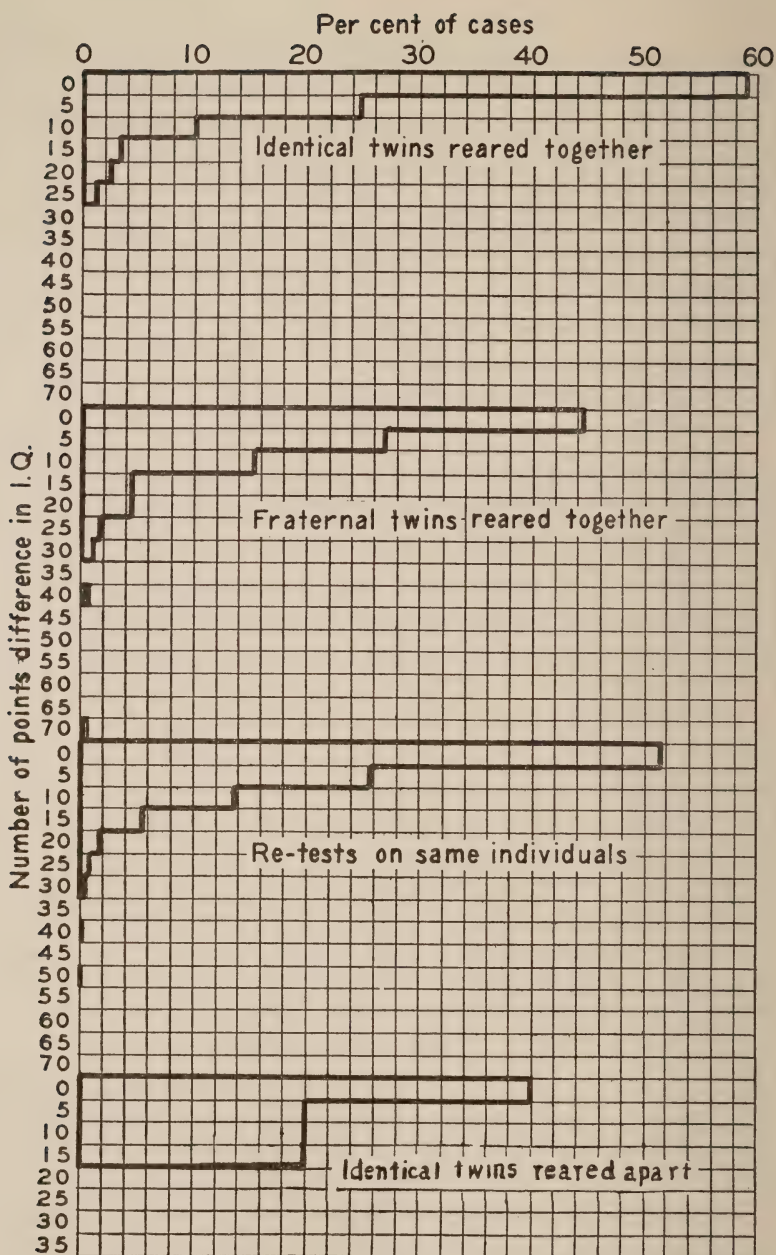
Intra-pair Difference	Twins		Identical (Reared Apart)	Test-Retest (Lincoln School Data)	Siblings Reared Together (Hildreth Data)	Siblings Reared Apart (Hildreth Freeman Data)	Unrelated Pairs	
	Identical (Tallman, Merriman, Bakwin Data)	Fraternal (Tallman, Mer'man, Averill Data)					Reared Together (30-100% of Life) (Hildreth Data)	Reared Apart (Hildreth Data)
	%	%	%	%	%	%	%	%
0-4	58.9	44.4	40.	51.5	23.	14.5	15.	13.
5	24.5	26.9	20.	25.7	25.	25.8	19.	15.
10	10.	15.2	20.	13.8	14.	18.6	11.	25.
15	3.3	4.7	20.	5.6	8.	14.5	20.	15.
20	2.2	4.7		1.8	6.	8.8	7.	4.
25	1.1	1.8		.8	14.	7.2	13.	8.
30		1.1		.6	4.	4.5	8.	7.
35					4.	3.2		4.
40		.6		.1	1.	.6	3.	3.
45						.6	1.	3.
50				.1	1.		3.	2.
55						1.		
60								
65						.6		
70		.6						
Total	593.5	842.0	800.	683.0	1455.0	1552.0	1775.0	1772.0
Avg.	5.9	8.4	7.7	6.8	14.5	15.5	17.7	17.7

\* Source of data as indicated.

TABLE 56

AGE DISTRIBUTION OF THE VARIOUS GENETIC GROUPS LISTED IN TABLE 55 AND FIGS. 25, 26.

	Twins		Identical (Reared Apart)	Test-Retest (Same Individuals)	Siblings		Unrelated Pairs	
	Identical	Fraternal			Reared Together	Reared Apart	Reared Together	Reared Apart
Md. (yrs.)	10.1	9.8	Adult		8.3	11.5	9.8	11.25
Q <sub>1</sub>	8.2	8.1	"		6.3	8.2	8.4	8.8
Q <sub>2</sub>	12.5	12.3	"		10.2	13.6	11.5	12.5
Range	5-15	3-16	13-58	3-18	3-14	5-15	5-14	5-15
N (prs.)	90	171	10	1112	100	193	100	100



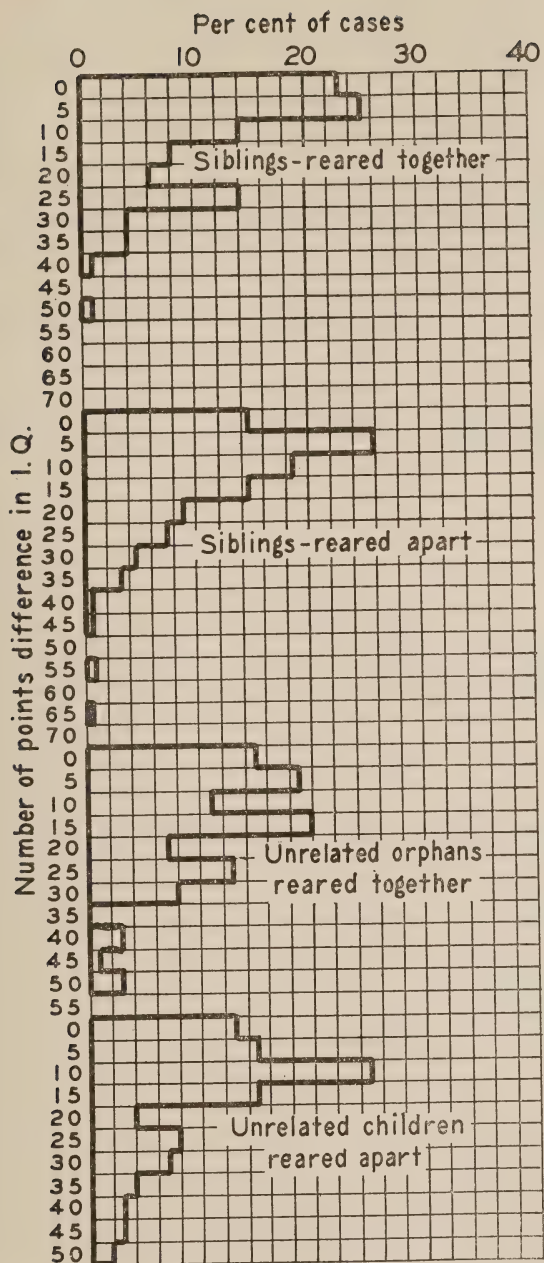


FIG. 25. DISTRIBUTION OF INTRA-PAIR DIFFERENCES IN I.Q. FOR VARIOUS TYPES OF GENETIC GROUPINGS. Data from Table 55.



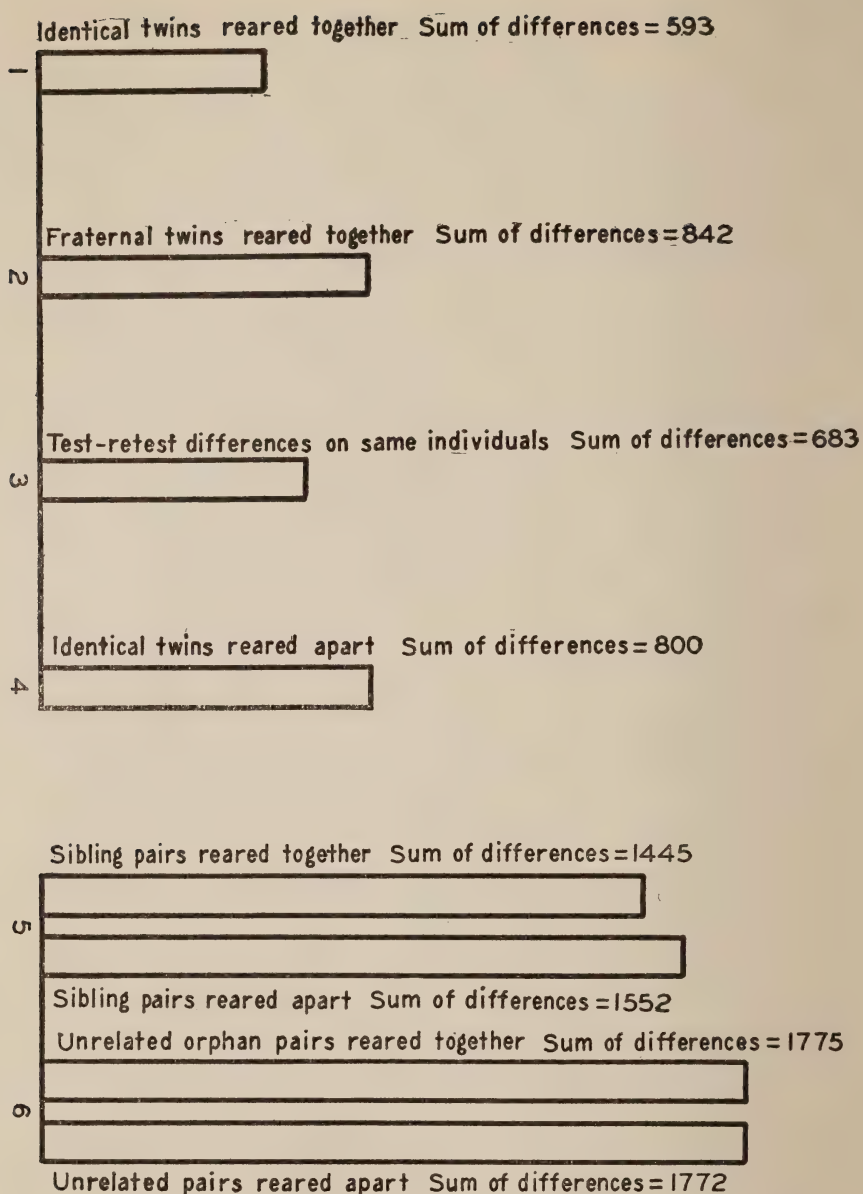


FIG. 26. AGGREGATE OF DIFFERENCES IN I.Q. BETWEEN PAIRED MEMBERS FOR VARIOUS GENETIC GROUPINGS.  $N=100$  for Each Group Except for No. 4, which Consisted of 10 Cases (X Ten). Data from Table 55.

Siblings who have been separated early in life, tend to resemble each other, in spite of their separate up-bringing. Children who have been removed from their parents in infancy or early childhood, continue to resemble their natural parents. Coefficients of resemblance of such separated relatives have been obtained by several investigators and are summed up in the following table. Included are the coefficients usually obtained for these same degrees of kinship, when the individuals concerned are reared together:

TABLE 57

COEFFICIENTS OF MENTAL RESEMBLANCE FOR SIBLING AND PARENT-CHILD RELATIONSHIPS, WHEN REARED TOGETHER, AND WHEN APART

Investigator	Siblings		Parent-Child	
	Together	Apart	Together	Apart
Hildreth (84) .....	.27 to .68	.49		
Freeman (125) .....		.34		
		.44 *		
Burks (125) .....			.45	
Lawrence (113) .....				.24 †
Avg. of several investigations.	.50		.30	

\* Freeman's data, ages 5-14, Negroes eliminated.

† Parental intelligence estimated by occupation.

Measurements, other than correlation coefficients, have been obtained to compare separated kin in mental abilities; the chief procedure being to compare the obtained I.Q. of the transferred child with the expected I.Q., *i.e.*, what his matched mates obtain, or what he would have obtained, had he not been removed from his native environment. As regards the effect of removal in general, the trend of this evidence has been to show a slight increase for children who had been elevated socially; and a slight, but insignificant decrease for children who had been lowered socially. To be effective as an influence on I.Q., change must be instituted at a very early age and maintained over several years of childhood. A common or uniform environment either in an orphanage or in a foster home, is not able to make unrelated children resemble one another. Foster parents and their wards are found to be somewhat alike, according to Freeman, and not at all alike according to Burks, who explains the Freeman finding as due to selective placement of the adopted children. Wide individual differences in native ability continue to manifest themselves in spite of similarities of environment. Practically every study bears eloquent testimony to this persistence of nature over nurture in accounting for differences among individuals.

Table 58 and Fig. 27 show the frequency distribution of I.Q.'s

of three groups of children: the California and Chicago children who were placed in foster homes, and the children, living in their own homes, on whom Terman had standardized his Binet tests. It will be noted that the California wards are not only higher on the average, but have also a slightly greater range than the other two groups. Both foster groups are distinctly more variable than Terman's normal group, with an emphasis in the direction of inferiority, although foster homes on the whole are selected with an emphasis on superiority. In other words, it would appear that the distinct advantage which comes with a good foster home has been powerless in some cases to elevate natively restricted mentalities, and powerful in other cases to enable natively bright minds to develop to capacity, a capacity which might not have been fulfilled had they remained in their native, social levels. Terman's

TABLE 58

DISTRIBUTION OF I.Q.'S IN PER CENTS AS FOUND FOR THREE DIFFERENT GROUPS \*

I.Q.	Burks (p. 261) (Foster)	Freeman (p. 152) (Foster)	Terman (p. 155) † (Unselected)
160-164 .....	.5	.2	
155 .....	.5	—	
150 .....	.5	—	
145 .....	.5	.2	
140 .....	—	—	.55
135 .....	1.5	.4	
130 .....	3.2	.2	2.3
125 .....	3.3	2.7	
120 .....	7.5	2.1	9.0
115 .....	11.3	5.8	
110 .....	13.	6.8	23.1
105 .....	15.	8.3	
100 .....	15.	13.2	33.9
95 .....	12.5	11.4	
90 .....	7.5	11.8	20.1
85 .....	3.5	9.3	
80 .....	1.	8.9	8.6
75 .....	1.5	7.4	
70 .....	1.0	6.0	2.3
65 .....	.5	2.3	
60 .....	—	2.1	0.33
55 .....	—	1.0	
50 .....	.5	—	
45 .....	—	—	
40 .....	.5	—	
Total.....	100.3	100.1	100.18
N .....	214.	484.	905.
Mean I.Q. ....	107.4	95.3	101.5
S.D. ....	15.0	16.3	13.0

\* Data from Burks, Freeman and Terman (125).

† The step intervals in Terman's group are in tens instead of in fives.



standardization group clusters around mediocrity; the foster groups manifest a "two-way stretch"—toward imbecility on the one hand and genius on the other. Or, in other words, an old finding (188, p. 304 f.) has been reënforced, namely that intensive training increases original individual differences; it does not "even them up."

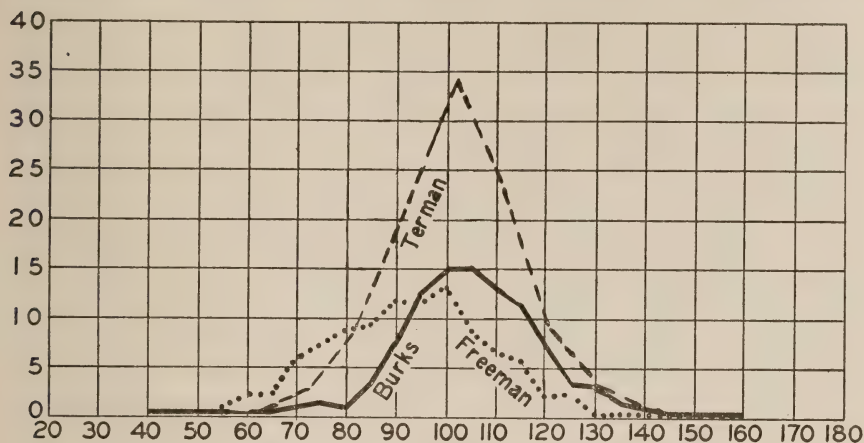


FIG. 27. DISTRIBUTION OF I.Q.'S IN PER CENTS AS FOUND FOR THREE DIFFERENT GROUPS: TWO FOSTER AND ONE CONTROL. CURVES SUPERIMPOSED TO SHOW VARIABILITIES. Data from Burks (*foster*), Freeman (*foster*), Terman (*control*) as set down in our Table 58.

### Comment

Since this section has drawn so extensively from reports in the 27th Year Book, particularly from the materials of Burks and Freeman, it would be unseemly to close the discussion on culture factors without acknowledging the eugenist's very real indebtedness to these pioneer experimental workers in the nature-nurture investigation. We again remind the reader that it is through experimental research and not through emotional controversy that valid insight and enlightenment will ever be attained. We particularly commend the attempt to study the influence on mental development of stated environmental factors. The Burks-Freeman approach is a rather wide swing away from the earlier family history studies which purported to study the influence of "heredity," irrespective of environmental conditions. Obviously one cannot be studied irrespective or independently of the other.

And yet the Freeman-Burks approach to the problem, *i.e.*, by asking the question: "What is the relative importance of nature and of nurture?" leads into a tangle of interrelationships which must first be carefully weeded out. The question, in itself, assumes

certain principles, which may or may not hold true; or which, if true at present, may change with changing conditions: (1) The potency of nature varies within fixed limits, having its own range, or distribution curve, for any adequately large, unselected human sample. An extreme case of the variability of potential to be found for any single stock, might be illustrated by contrasting the final mental status of a Tarzan, reared in the jungle, with his cousin, reared in English educational luxury. Tarzan, having only the apes for company, still could not be held down to idiocy, because innately he was bright. His limit of development represents the lowest possible for his congenital make-up. Reared with his cousin, he might have developed an I.Q. "above 140," the highest possible for his particular make-up. How wide a range for a superior endowed individual! Contrast this range with that of a congenital low-grade idiot. The latter, if born and reared among the first families of Boston would not be essentially different from what he would be if reared in the slums. Here the range of potential is small. The above hypothesis is in line with findings of Thorndike (201, pp. 304 ff.) that the brighter individuals profit most from training. Or in other words, training increases individual differences.

(2) A second assumption in the "relative importance" approach is that *nurture*, too, has fixed upper and lower limits, with its own distribution curve. The assumption is made also that the number or proportion of homes of various standards of culture is the same in different localities, city and country, wherever the investigation is carried on.

(3) A third inference is that variation in both nature and nurture is static; *i.e.* that their curves have not changed from age to age, or place to place. A dynamic interpretation would not permit the question of "relative importance," as though these factors were fixed entities with respect to each other. To illustrate: A change in the forces at work which determine either the present distribution of intelligence or the present distribution of home culture (school and other educational influences) would alter the respective importance of the biological and social factors: *e.g.*, Elimination of the lower mental levels, as advocated, or elimination of the upper mental levels, as feared, by present eugenicists, would greatly reduce the biological range of native brightness. If the biological factor in variation is thus restricted, the relative importance of the nurture factor will, *ipso facto*, become greater. On the other hand, if social and educational opportunities become more varied, not only would the range of I.Q.'s be extended, but the relative importance of *nurture* as compared with *nature* would also

be increased. Equalization in educational opportunity, *i.e.*, decreasing the nurture variable, would render more significant the nature variable in producing variance in measured intelligence.\*

Such considerations might well be brought to an interpretation of the California and Chicago data. Let us assume, hypothetically, that the Chicago sample was more restricted genetically than the California sample: *e.g.*, (a) that there was a selection from the *lower end* of the distribution curve of innate brightness among individuals. Curtailment or absence of the genetically superior individuals from this group would, in view of argument (1) above, enormously increase the contribution of nurture factors toward final variability of the I.Q.'s of these children. (b) If, in addition, the foster homes represented a *wider spread* on the cultural scale from high to low than did the homes in the California study, then again, this would add to the significance of the nurture factor (for this sample) in determining final variance in I.Q. The same of course might apply to other culture factors, such as schooling, for the two groups.

If, on the other hand, the congenital stock in the California sample represented a larger proportion of *superior* individuals (than did the Chicago sample), the biological factor becomes more important in producing variance in measured intelligence. If, in addition, the cultural standards of foster homes and educational opportunities in the California schools differed but little among themselves (*i.e.*, were narrowly grouped on a scale), the influence of the nurture factor would be low in producing final variance; and the influence of the nature factor proportionately more significant. (See 123, p. 391.)

Differences in the genetic sampling and in the sociological placements of the two groups of children might well be studied more critically.

#### C. CHANGE IN SPECIFIC ENVIRONMENTAL FACTORS—MENTAL LEVELS APPROXIMATELY SIMILAR

##### *i. Culture Variables*

We are ready now to consider a block of studies on the effect of stated environmental differences in bringing about changes in mental test ability of groups of individuals. Knowing what the expected congenital ability of a group would be under normal con-

\* Murphy (123, p. 391) brings home this point forcibly, but too often it tends to be ignored.



ditions (see pp. 238-39), it is possible to compare the attained ability of a similar group under change of circumstance. For this reason, it is important to have norms or standard scores made by the various groupings, these norms to be used as a base, against which experimental scores can be contrasted and compared. This method employs measures of central tendencies and variation of similar groups (experimental as against matched or control individuals).

It is not always possible, however, to secure such "pre-exposure" norms, in which case some other technique must be employed. For example, newly arrived immigrants in the United States cannot be fairly tested by an American test; hence there is no base against which the influence of continued American residence can be checked. The procedure then becomes one of studying the *variability* of abilities of a group in relation to the *extent of residence* in this country. The immigrant group offers an additional problem in taking a test—a problem which we shall now consider—namely, the interference of an inadequate knowledge of our language at time of testing.

#### LANGUAGE HANDICAP AND MENTAL RATINGS ON TESTS

This factor of the extent of knowledge of English determines to some extent the Subject's ability to answer the test questions; the other determiner is his native wit and effort. For the native born, there is so high a correlation between verbal ability and I.Q. that a measure of one may, at times, be substituted for a measure of the other. But although this same generality may be made to apply to the foreign born, another factor must also be recognized in the acquisition of the adopted language, namely, the length of residence in the new country. Obviously, the very recent comer, however bright, is handicapped. Hence allowance must be made up to a certain point for such handicap. Investigators who have sought to learn the real mental ability of the foreign born have approached their problem from different angles: (1) One well established procedure is to use non-verbal or performance tests as measures. But these tests, although avoiding the use of language both in question and response, are on the whole less reliable as measures of general intelligence. (See p. 32 ff.) (2) A second plan is to estimate the relation between knowledge of English and length of residence in the English-speaking country, other opportunities for normal development of intelligence being equal, and to allow for handicap.

Murdock, Maddow, and Berg (125) report investigating the

relationship between the foreign-born's knowledge of English and his ability to score on an American intelligence test. These workers found that for Jewish families in New York City who had lived at least three years in the United States, the extent of use of English in the home was in itself an indication of mental ability. They also found that for such groups the verbal test given (Otis) was as fair a measure of intelligence as was the non-verbal (International). In other words, it would appear that the brighter will learn English more quickly, will use it more extensively, and will not be handicapped (after a period of residence to establish learning) if tested by a verbal test.

If these conclusions hold for other foreign-born groups who have been exposed for three or more years to opportunities to learn our language, obviously much of the agitation which has been raised about the unfairness of the English verbal test to the foreigner in America is unfounded. When a foreigner from the upper social levels resides in this country it is noted (empirically) that he learns English very quickly; usually having fair to good fluency in expressing himself after a year or so of residence. As far as we know, no study has been made of the facility in acquisition of English by the foreign born, when classified according to original social level, but such a project would go far towards reflecting the extent to which "foreignness" is a handicap, and "inborn wit" is an asset in adjusting to the new language requirements. (See also 103.) It might also uncover the interesting fact that previous knowledge of some foreign tongues is an asset in building up an English vocabulary, because of the large number of words which can be transferred from one language to another.

#### BI-LINGUALISM AND THE NATIVE BORN

Studies will now be considered which seem marginally related to the handicap of the foreign born in learning a second language, and the distribution of various racial intelligences within one cultural medium.

Investigations of the effects of *early exposure to a bi-lingual influence* have come from Wales, by Saer (166) and by Smith (182) on I.Q.'s of children growing up in a Welsh-English environment; and from Canada by Jameson and Sandiford (96), who reported on the mental capacity of Southern Ontario Indians, speaking English and their native dialect. The result of these investigations cannot be reproduced here in detail, but the finding common to all three researches is that parallel learning of two languages

during the developmental period results in some mental confusion and lowered I.Q. when tested in either language. This handicap of the bi-linguist over the monoglot may not be serious, but it seems to be persistent even through university levels. Whether the nature and extent of the exerted bi-lingual influence may vary with the native individual differences of the group does not seem to have been investigated. Such a study would be promising. It would again involve the separation of similar original Subjects, one group to be used as a Control, the other group to be used as Experimental Subjects, given intensive parallel training in two languages with final re-testing of both groups.

#### RURAL *versus* URBAN ENVIRONMENTS

A lucrative field of research is that offered in the rural-urban studies. Just exactly what does the city offer or contribute toward the development of intelligence which is absent from the rural environment? Many studies have been undertaken in America and England [reviewed by Pintner (156), Shimberg (178), and Sorokin and Zimmerman (184)] which show a general retardation of rural children in their ability to score on intelligence tests. Is this superior urban score due to a congenitally superior group, *i.e.*, is the population "selected" according to abilities, the brighter having moved to the cities? Or does it perhaps mean that urban children have utilized their native potentialities to better advantage; that they are, in other words, functioning at the upper rather than lower limits of their congenital "range" of I.Q.? (See Chapter III, p. 162 f.) May it be perhaps because of wider stimuli offered in the city through a more effective school organization and higher grade teachers, through library, museum, club, and supervised recreational facilities, through a broader range of companionships from which chums can be selected on the basis of congeniality and mental appeal, rather than on neighborhood proximity alone? Or, is it due to almost any other factors which might be considered to have an influencing effect on I.Q.?

Investigations agree that a difference exists between the average I.Q. of children in cities and children in rural areas—favoring the city. See Pressey (161-162), Baldwin, Fillmore and Hadley (10), Jones, *et al.* (98) Other investigations suggest that children in remote rural districts test higher than children in rural areas adjacent to urban centers. See Thomson (197), Bickersteth (15), Duff and Thomson (42), and Jones (98, p. 66). This finding strongly hints at a selective migration away from the hinterland



towards cities. There may, then, be a real difference in native ability of the two groups. Such a suggestion is offered with extreme caution.

Does the fact of greater educational advantage offered by the cities explain the higher intelligence of the city child over his rural neighbor? Such a conclusion should also be offered with caution.

One by one the various advantages should be investigated for their developmental effect. No doubt their influences interlock and amalgamate, one supporting the other, but the extent to which these factors, separately or in combination, influence the size of I.Q. (or the separate components of intelligence) should be subjected to investigation. Jones, *et al.* (98), have already undertaken to estimate the discriminating effect on various sub-test elements of the Binet. (See pp. 295 ff.) In general, analysis of urban-rural data yields results such as those reached in the Baldwin, Fillmore, and Hadley (10) studies, *i.e.*, that there is no significant difference among rural and city children *for the younger ages*. Matched, age for age, the rural babies accredit themselves equally well on the baby tests, up to about the age of three years. Between three and six years only the five and six year old rurals fall behind the city children in their ability to score on the Detroit Kindergarten Test. The investigators suggest that this inferiority may be due to a lack of verbal ability, and possibly to a smaller supply of books and pictures in the home of the rural child. Since the tests embody these very materials, the deprivation would rob the child of previous practice in handling them.

### School Children

When children of school age were compared as to abilities in verbal and non-verbal tests, it was found that there were no real differences in their ability to handle the concrete materials. In verbal skill, however, the two groups did not compare so favorably; neither did children in different rural communities show equal abilities on the average.

From the above results, the conclusion might be drawn: (1) That performance ability was evenly distributed in different environments, and that *ipso facto* its development is equally stimulated in varying environments; and (2) that verbal ability is unevenly distributed between rural and city environments, and that *ipso facto*, the city is a more favorable growth medium, by virtue of the greater stimulus and opportunity it gives for developing a

vocabulary. The nice questions to answer are: (1) Whether verbal ability, under different circumstances of development, is always an equally fair index of native intelligence; or (2) whether the growth of intelligence is so inextricably bound up with the acquisition of verbal skill that the differences in the end-product, intelligence as measured by the test, is all that need be concerned about. In the latter case, by evening up the handicap (which is being done to some extent by the radio), the intelligence of the country child can be built up within a generation or two to match the city child. If after equal training they still differ, then we might conclude that the inter-group differences are native, due perhaps to selective migration, rather than to environmental influence.

#### MENTAL TEST SCORES IN AN EXTREMELY "ISOLATED" ENVIRONMENT

In this connection it may be interesting to take up the results of a minor study reported by Ludeman and McAnelly (118). Group intelligence tests, both verbal and non-verbal, were administered to a group of thirty-two children attending a one-room school and living in an extremely limited communistic settlement. These children were cut off from all contact with the outside world, having no access whatever to telephone, electric lights, newspapers, automobile, radio, or movie. No opportunity was given them to handle money or conduct their own affairs in any way, nor were they allowed to leave the colony. A set of religious traditions dominated their rule of life, their worship, their marriages, indeed all of their social and personal relationships.

On the Kingsbury and Myers group tests the younger children averaged 72.6 and 72.1 I.Q.; on the National and Myers group tests the older children obtained averages of 66.3 and 68.8 I.Q. These I.Q.'s are well in arrear of the averages obtained by children in a normal American environment. Yet the investigators had reasons to feel that the congenital intelligence of these children was normal, as judged by their parents' general thriftiness and adaptation. These children were doubtless penalized by a test which was not fitted to their rearing. The authors pointed out that in those parts of the test which are not concerned with worldly material, the children did as well as ordinary children do. They concluded that "the average mental test is a measure of acquired intelligence as well as of innate capacity."

To the present writer this hardly seems the comment to make. It must be understood basically that in order to answer the ques-

tions on our intelligence tests, children *must have had a normal opportunity for contact* with the sort of material taken up in the test. The American test *assumes* certain experiences as common to the average child of a normal American environment. As soon as this environment becomes abnormal, the only conclusion to be drawn is that the test is unfair; never that the child is abnormal; nor that the intelligence of the resident in any environment has so much "acquired intelligence" plus so much "innate capacity." The issue is rather (or should be) "to what extent have the minds in any environment profited by what resources they have had in the way of mental nourishment?" Obviously, also, any environment above or below the so-called "normal" American environment should have its own test norms; and children from widely differing localities should not be compared with one another by the same measuring rod. This is merely another concrete instance to reënforce the argument that separate cultural environments should have their own test standardizations. For a fuller discussion of this matter, the reader is referred to our chapter on the Measurement of Intelligence. (pp. 41 ff)

#### ATTENDANCE AT SCHOOL

We have considered so far the contribution which seems to have been made by several factors of the environment in shaping the child's I.Q., namely, the social, economic, or cultural status of the home; the language spoken in the home; the fact of bilingualism throughout the developmental period; residence in urban, rural or remote communities; with a minor allusion to the matter of adequate test standardization and norms. We now face the one vastly accredited, almost glorified factor in American life, namely, formal schooling. In a country like the United States where free and compulsory education is the rule, the public school has been referred to as the "great leveler," "the democratic ideal," *etc., etc.* The unskilled laborer, conscious of his own intellectual limitations, insists that his son shall achieve higher intelligence through attendance at school. Parents in modest circumstances accumulate savings of a lifetime to send their children to college. In the remotest mountain or rural community, where six or eight children can be gathered together in the name of education, the government subsidizes a school. In certain highly congested urban districts where every child has had almost every opportunity to attend school since the age of six, the Board of Education yet insists that he continue until the age of sixteen. Millions of dollars are ap-



propriated year after year toward the erection of finer buildings, better equipment, higher grade instruction. Everywhere is reflected the underlying philosophy of the American attitude: "The school makes the man."

And to what extent does the school make the man? Or, at least, how far is it responsible for his mental level? Is the general level of American intelligence, exposed now for two or three generations to compulsory education for all, higher than the level of intelligence of other nationals whose opportunities for formal schooling are class restricted or stratified? It is doubtful if this question has ever been adequately investigated.

The subsequent discussion does not preclude a recognition of benefits to mankind other than the raising of the level of popular intelligence; benefits such as better standards and ideals of living, material culture, aesthetic appreciations, more worth while use of leisure time, improved health and physique, vocational training, "character building," *etc.*, *etc.*, or whatever other objectives may be cited for the school, or results may accrue from attendance thereat. Here we shall confine our search as much as possible to results which throw light on the question: How much does the school contribute toward building up the I.Q.? Does increased attendance in school (other things being equal) make for higher I.Q. and does deficient attendance result in lowered I.Q.? Is there any direct correlation between quality of instruction and variation in I.Q.? Between expenditures for improvement of schools and school equipment, and population levels of mental ability?

### Effects of Schooling on Test Intelligence

Several studies come to mind and might be reviewed at length, but many of these are concerned with the relation of school influences to achievement in school subject matter. (See 126)

Burt (20) has submitted a statistical study on the influence of schooling on Binet-Simon responses. His conclusions, which follow, are an interesting example of the point of view prevalent a decade ago:

"To achieve distinction . . . experience must be heavily supplemented; it must be reinforced either by the artificial aids supplied by a civilized society, or by the natural stimulus of an unusual native wit. Imagine two children, aged seven and seventeen respectively, both possessing an intelligence equally normal, neither having passed a single hour in school. The younger, as a consideration of the several tests will show, might reach a mental age of six; the older, in spite of ten

years of seniority, barely that of nine. So barren is growth deprived of opportunity." (p. 183)

Reference to Burt's study is included here because it has often been cited in the literature on the effect of schooling on the I.Q. But it has been severely criticized from the point of method in arriving at a conclusion. See F. S. Freeman (58), G. H. Thomson (198), Holzinger, *et al.* (125), and Burks (125). As F. S. Freeman states, in the interpretation of what is cause and what is effect:

"It is just as reasonable to conclude that successful performance on the Binet and successful school work are dependent on similar elements, and hence success in one is likely to indicate a fair amount of success in the others." (Quoted by Dearborn (39), p. 110)

In other words, school experience may contribute to Binet standing, or, equally true, it might be deduced that Binet ability might determine school achievement. Hence Burt's conclusion, whatever its earlier impression, cannot be considered valid.

Gordon (79) presented data to show that amount of schooling contributed as much to success on intelligence test as it did to standing on an educational test. He compared results obtained on both kinds of testing, from five different groups of children, having varying amounts of schooling. His results are summed up in tabular form on page 287.

The "educational ratios" were closely similar to the mental ratios for the above groups; when attendance was partialled out, the relationship was still high. This would suggest that educational achievement depends more on I.Q. than on attendance at school. It was also noted that with increase of age there was a decrease of I.Q. as set down for the four groups in the table below. Among the Canal Boat children those under age six averaged 90 to 100 I.Q.; those over nine averaged under 70 I.Q., showing not only that older sibs were found to be more retarded than younger sibs, but also that test intelligence deteriorated as the child grew older. Correlating the two variables, age and I.Q., Gordon obtained the following coefficients:

TABLE 59  
CORRELATION BETWEEN AGE AND I.Q.; AND AGE AND E.Q. \*

	Age and I.Q.	Age and E.Q.
Canal Boat Children .....	$r = -.755 \pm .033$	—
Gypsy Children .....	$r = -.566$	— .374
Physical Defectives .....	$r = -.37 \pm .07$	— .288
	$r = -.42 \pm .06$	
Backward Children (67) .....	$r = -.472$	— .466

\* Data from Gordon, 79, p. 82.

A negative correlation here means that the older the child the lower the I.Q., especially so in the case of the Canal Boat children, suggesting that environment has an effect (of about thirty points) over several years of development. A negative coefficient ( $-.08 \pm .08$ ) between attendance and I.Q. (See Table 60) for the mental defective group suggests that those who have gone to school longest are dumbest within that group; that schooling is unable to raise the intelligence; or that final intelligence after continued schooling is dependent more on innate factors than on educational.

Gordon's conclusion is that, except in the case of very young children, mental tests do not measure native ability apart from schooling, or at least apart from mental exercises of the sort supplied by schooling, or a good social environment, in lieu of such schooling.

This, in essence, is the assumption upon which the Stanford-Binet was based. Reference to our discussion in the chapter on the Measurement of Intelligence will remind the reader again that this test is to be considered as valid only for those children who have had normal and more or less uniform opportunities, to obtain the kind of experience which forms the content of the Stanford-Binet test. Obviously, when a test standardized on such a medium is applied to children falling definitely outside of that medium, the conclusion must follow, not that the children are inferior in intelligence, but that the test was unfair as a measure, and comparisons should not be drawn on the basis of that measurement.

It may be quite true that the kind of life followed by Canal Boat and Gypsy children results in retarding the development of the capacity to learn, to reason, and to generalize, but the degree to which this retarding may be operative cannot be ascertained by tests which involve reference to school materials; also, as Gordon himself indicates (for his Gypsy and Canal Boat children), there may be a mental development in other directions. This could be ascertained only by applying tests specially devised for their special kind of environment.

We shall now turn our attention to two studies which seek to find how much deviations in intelligence (as well as in school achievement) are dependent upon ordinary variations in school attendance for children, all living in a normal (American) environment.

Heilman (126) studied the school attainments and I.Q.'s of a large group of unselected ten-year-old children in Colorado, and



TABLE 60  
COMPARATIVE DATA ON GROUPS VARYING AS TO SCHOOLING \*

Groups	Age	No.	Average Amount Schooling	%	Average Mental Ratio	Average Educational Ratio	r Between Mental Ratio and School Attendance	r Between Educational Ratio and Attendance	r Between Mental and Educational Ratio	r Between E.Q. and I.Q. with Attendance Constant
Canal Boat .....	4-14	76	5		69.6				.715 ± .054	.78
Gypsy .....	5-13	82	35		74.5		.283 ± .08	.289 ± .079	.784 ± .033	.76
Physical Defective .....	6-12	184	48		85.5		.313 ± .066	.313 ± .066	.785	.58
Backward .....	7-14	76	67		71.8		.082 ± .08	.146 ± .076	.668	
Ordinary P.S. ....			88		100					
"Very poor" school .....			87							

\* Adapted from Gordon, 79.

† There were children who could not do the simple scholastic tests; obviously their inclusion would lower the average of their whole group.

found that less than thirteen per cent of their very wide range of differences in educational age was due to differences in quantity of time spent at school, and that probably fifty per cent was due to hereditary factors (p. 64). Regardless of deficiencies or extensions in school attendance, children tend to reach a degree of success and school placement commensurate with their *mental level as measured by test*. Heilman found a coefficient of .3 between M. A. and school attendance, which may mean, as Terman (194) points out, either that: (1) I.Q. is affected by attendance at school; (2) that school attendance is affected by brightness; or that (3) the influence works in both directions. (See Burks' comments on Burt's conclusions (126, p. 301). Heilman finds also that not over one per cent of the variation in educational age is due to the socio-economic status of the home and about thirty-six per cent to such hereditary and environmental factors as had not been accounted for.

Denworth's (126) investigation, although carried on in New York City, a markedly different community from Denver, Colorado, and although employing different techniques and approaches, bears out Heilman's results. Denworth studied the attendance records of 700 unselected school children and correlated the amount of attendance with scores on Stanford-Binet mental test, and on the Stanford Achievement test of school attainment. She found that variations in school achievement and success depended only very slightly on varying amounts of exposure to school instruction, but that such individual variations depended considerably on variations in mental ability, such data, of course, yielding a negligible correlation ( $r = .21 \pm .02$ , p. 79) between length of school attendance and mental age, with C. A. constant. Denworth writes:

"Comparison of the results of mental age, of length of school attendance, and of chronological age, correlated with educational age, particularly for groups of uniform chronological age, shows that intelligence has contributed much more heavily than either attendance or age to the educational achievement of the children studied." (p. 88)

A slightly different analysis was made by Wechsler (209), who attacked the problem of the influence of education on Binet test performance by studying the *variability* in mental age for successive chronological ages. Coefficients of variation for each chronological age between six years and fourteen years on Terman's and Burt's original data were compared and examined, for reliability of the differences found. Wechsler's argument is that if education influences test score, then the longer exposure to schooling should tend

to make individuals more (or less) alike, *i.e.*, would increase or decrease variabilities (range of scores). If the variabilities remain the same from year to year, then it could be concluded that education is somewhat powerless to change original differences among individuals.

Wechsler's results are somewhat anomalous and inconsistent, in that for data obtained from Terman no change in variation of individual differences is shown until year fourteen, when there is a decided drop; in data obtained from Burt the drop begins at year ten, and is maintained through year fourteen. Wechsler gives the preference, in interpretation, to Burt's data, because of a wider sampling of cases for each year.

He concludes that education does not influence Binet test score until about age ten, when pupils give up devoting time to a mastery of skill subjects (the "three R's") and begin acquiring knowledge and information (content subjects). It is this latter which influences test score beyond age ten. Paradoxically enough, Wechsler finds that an early I.Q. diagnosis (between five and ten) is more reliable for prognosis than is a later one (beyond age ten), and hence more nearly representative of potential native equipment.

#### ATTENDANCE AT NURSERY SCHOOL AND THE I.Q.

It will be recalled that some of the research evidence on the effects of improved home conditions on the I.Q. relate to the age at which the child is placed in the better home. It seems that an early age of transfer from a poor to a good environment insures not only a greater gain in I.Q., but a lasting gain. If this generalization holds for early home training, it might also be expected to hold for early school training. If the infant or very young child is placed in a desirable nursery school medium which emphasizes certain knowledges, skills, habits, attitudes and other elements reflected in a test situation, will the nursery school child score higher than the stay-at-home child? Will any such advantage found be maintained throughout the child's life?

Woolley (227) compared the scores of children who had attended nursery school for from seven to fourteen months with the scores of children of the same age and social status, who had not attended school, but whose names were on the waiting list. Both groups of children had been tested earlier upon applying for admission and the test-retest differences in scores for the two groups were compared. These individual increases, decreases, and constants, were contrasted with findings of Terman and Baldwin. It will be



noted in Table 61 that the nursery group registers more improvement than the others.

Woolley, herself, points out that the gain in I.Q. (on the Merrill-Palmer tests) which she found for her nursery school group may be due as much to factors other than gain in intelligence, such as the rapid response which the young child makes to improved change in environment, or it may be that nursery school training in certain emotional difficulties (extreme shyness, negativism and reluctance to coöperate) may have prepared the child for a better adjustment to the second test situation. Woolley was unable, from her data, to predict whether or not this initial gain would be maintained over a period of time, but she comments that "a certain part of what we later call 'level of intelligence' may be due to the opportunities to learn given to young children."

Woolley's findings are set down in the table below:

TABLE 61

NUMBER AND AVERAGE AMOUNT OF INCREASE AND DECREASE IN I.Q. ALLOWING A RANGE OF FIVE POINTS, PLUS OR MINUS, WHICH IS CALLED CONSTANT \*

	Merrill-Palmer Group			Waiting List Group			Terman's Group		
	No.	%	Avg. Chg.	No.	%	Avg. Chg.	No.	%	Avg. Chg.
Increase	27	63	19.7	12	33	12.7	25	25	10.6
Decrease	8	18.5	10.8	13	36	16.2	27	27	11.9
Constant	8	18.5		11	31		47	47	
Total	43			36			99		

\* From Woolley, 227.

In an experiment, of the sort just described, one is always tempted to wonder how far other factors than the variable in question may have been operating to affect the scores of one group of children which may not have been operating for the other. Hence Goodenough's (125) study is of special interest because of the great care she took to control other variables, such as sex, age, paternal occupation, education and nativity of parents, and intellectual status of the children at the beginning of the experiment.

Both groups of children were tested by the same Examiner, under the same conditions and by the same test, the Kuhlmann-Binet. There were twenty-eight children in each group, one set having had nursery school training for one year, and the other having been without it. Goodenough's results are reported (1) in terms of average I.Q. differences for each group; and (2) in terms of correlation between gain in I.Q. and length of time spent in nursery school for the different attendants.

She found a slightly higher, but insignificant, difference in favor

of the nursery group, but no tendency for those who had gone to school longest to have the higher I.Q.'s. Incidentally, too, the greatest *individual* changes, gain and loss, were found among the control group. In a separate analysis of test elements no greater gain was found in use of material and types of performance which had been stressed in nursery school training; nor did the children who had had this training excel in ability over those who had not. (See Goodenough's table, p. 367.)

A further improvement in technique is followed in Barrett and Koch's (14) experiment. These workers matched their seventeen experimental and seventeen control Subjects for age, sigma score on the Merrill-Palmer test, and time interval between test and re-test. Then, too, in the case of the experimental Subjects, attendance at school meant a definite change from a *poor to a very good environment* on a twenty-four hour a day schedule. Results were compared with a third and unmatched nursery group. The results showed a definite gain for the children who had attended nursery school.

To quote:

"The results of the retest, however, showed our nursery orphans to be farther above the normal than they were below on Test 1. . . . The control group showed no such phenomena. Though our methods of analysis are too crude to yield conclusive results, they lead us to infer that nursery school activities and methods in some way raise the general accomplishment level of children." (p. 119)

TABLE 62  
I.Q. TEST-RETEST RESULTS FOR PRESCHOOL GROUPS \*

	Average on 1st Test	Average on Re-test	Difference
Nursery School Group .....	91.71	112.57	20.86
Control .....	92.59	97.71	5.12
Unmatched .....	83.60	96.00	12.40

\* From Barrett and Koch, 14, p. 112.

Hildreth's (84) report is interesting in that it carries the research on, into and through, the first grade. Two groups of about forty children each, approximately equated as to age, economic and social status, and sex proportion, were compared before entering the first grade. The one group had gone to nursery school, the other had not. On entering first grade the nursery school graduates had an average advantage of six points I.Q. by test and at the end of first grade there was no further advantage; whereas, those children who had never been to nursery school gained on the average

three points. Hildreth concludes that the gain which came as a result of going to nursery school is temporary and artificial, as it tended to disappear within eighteen months of regular schooling. More data are needed, as the small numbers of cases worked with merely suggest rather than establish any statistically reliable conclusion.

Wellman (210, 211) carries Hildreth's point of attack still further. She is concerned with whether or not the increase in I.Q. through attendance at nursery school, noted by three of the investigators, is maintained. Wellman's data cover a longer period. Her study (210) was reported at the Annual Meeting of the American Psychological Association in Toronto, 1931. In a communication to the writer, Wellman has, in part, summed up her experiment as follows:

"Forty-five children, two, three and four years of age on their first test, were selected on the following bases: (1) That they should have had at least four tests at six months' intervals, beginning in the fall with their entrance to a preschool group. (2) That they should not have attended our summer preschool session.

"These forty-five children gained ten points in I.Q. from the first fall to the first spring, less than one point from that spring to the next fall, and gained five points from the second fall to the second spring. Their total gain over one and one-half years was 15.6 points. Twelve of these forty-five children had had an additional test the following fall and ten had had still one more test the following spring. The gains from fall to spring for these children were similar to those for the forty-five children. The correlations of I.Q.'s between fall and spring tests for the forty-five children were  $.84 \pm .03$  and  $.85 \pm .04$ . That these gains were not due to practice effects is shown by comparisons of changes from fall to spring and spring to fall for larger groups of children when the number of tests was kept constant. Three hundred ten cases showed a gain of 7.8 points from fall to spring and 193 cases showed a loss of .9 of a point from spring to fall. The explanation that seems best to fit the facts is that preschool attendance, at least in the Iowa Laboratories, causes a rise in I.Q., the rise being cumulative from year to year, and sustained throughout the school years when the children are in the environment provided by our University Elementary School. When the same children are home over comparable intervals they fail to gain, although maintaining their higher level. The determination of whether these I.Q.'s are real or inflated remains for further research." \* (letter to writer)

In this connection may be mentioned the finding of Heilman (126) in regard to 800 ten-year-olds who had attended kinder-

\* It is obvious that the above findings bear materially on the general matter of constancy of I.Q. Cf. pp. 51 ff of this book.



garten for one year, and who showed no advantage in I.Q. over a control group of ten-year-olds who had not attended.

#### COMPARATIVE EFFECT OF SEVERAL SPECIFIC ENVIRONMENTAL FACTORS ON THE MENTAL ABILITY OF THE THREE-YEAR-OLD

In 1929, Van Alstyne (205) carried out an interesting study on the possible significance of certain specific factors in the environment in determining mental status. Her study has special weight in that it confined itself to the low chronological age of three years, when (judging from the suggestive evidence of preceding reports) the possible influence of environment can be considered as at its maximum potential. Van Alstyne selected, on the basis of expert opinion, certain aspects of the environment which would seem to be highly important in bearing on mental development—such as: Number of constructive toys, hours of “being read to,” *etc.*; and certain other factors which pre-formed judgments suggested as having a minimum of influence in shaping mental development—such as cleanliness, possession of own bed, height, *etc.*

Her chief technique was that of correlating many different sets of variables. Quite conscious of the fact that it is not valid to argue causation from correlation, Van Alstyne was, nevertheless, able to present an interesting array of coefficients which indicate varying intensities of relationships for the various specific environmental elements. Her results are illuminating.

Even at this early age, thirty-three to thirty-nine months, there appears to be no higher relation between the child’s mental age and the environment, than between the Mother’s M.A. and the environment. It is scarcely reasonable to think that these elements affect the Mother’s intelligence, since they are “inextricably related to it,” hence they cannot be held responsible for the child’s mental development any more than can the Mother’s intelligence itself, which by maturity is pretty well set.

A glance at the correlations between the child’s ability and other factors reveals that the coefficients for the least favorable factors, as prejudged, were just as high as coefficients for the most favorable factors, as prejudged.

Also, when considering environmental effect on a “mental process,” rather than on the composite of “test intelligence,” it is to be noted that the relation between environment and “vocabulary” is somewhat higher (but not much) than the relationship between environment and “intelligence.”

Van Alstyne insists that her research does not attempt to show

the effects of those environmental elements on intelligence. She is merely concerned in studying relationships.

COMPARATIVE CORRELATIONS OF SEVERAL SPECIFIC FACTORS IN THE ENVIRONMENT AND HEREDITY WITH CHILD'S I.Q.

Specific elements of environment, such as the vocabulary of father and mother, the rating of the home by the Whittier Index and also by a specially devised culture index, grade reached by father and mother, parental supervision, income, number of books in the home library, owning or renting of the home, the number of books in the child's library, private tutoring, weekly hours of home instruction by members of the household, were considered in Burks' (125) comparison of the resemblance of foster children to their parents and the resemblance of own children to their parents.

These coefficients of correlation between the child's I.Q. on Stanford-Binet and elements of environment were set up in rank order with the coefficients of correlation between the child's I.Q. and certain hereditary factors, such as the parental M.A. A glance

TABLE 63

CHILD'S I.Q. CORRELATED WITH ENVIRONMENTAL AND HEREDITY FACTORS \*

Factor	R	Foster		R	Control	
		P.E.	N		P.E.	N
Father's M.A. ....	.07	.05	178	.45	.05	100
Mother's M.A. ....	.19	.05	204	.46	.05	105
Midparent M.A. ....	.20	.05	174	.52	.05	100
Father's vocabulary .....	.13	.05	181	.47	.05	101
Mother's vocabulary .....	.23	.04	202	.43	.05	104
Whittier index .....	.21	.04	206	.42	.05	104
Culture index .....	.25	.05	186	.44	.05	101
Father's grade at school.....	.01	.05	173	.27	.06	102
Mother's grade at school.....	.17	.05	194	.27	.06	103
Parental supervision .....	.12	.05	206	.40	.09	104
Income .....	.23	.05	181	.24	.06	99
Number books library .....	.16	.05	194	.34	.06	100
Own or rent home.....	.25	.07	149	.32	.10	100
No. books on child's library....	.32	.04	191	.32	.06	101
Private tutoring, music, dancing, etc.						
Boys .....	.06	.10	77	.43	.11	46
Girls .....	.31	.08	108	.52	.09	56
Home instruction by members of household (hours weekly):						
Ages 2 and 3.....	.34	.04	181	— .05	.07	101
Ages 4 and 5.....	.15	.06	129	— .03	.08	71
Ages 6 and 7.....	.03	.07	88	.24	.09	46
Father's rating of child's intelli- gence .....	.49	.04	164	.32	.06	98
Mother's rating of child's intelli- gence .....	.39	.04	181	.52	.05	101

\* From Burks, 125, p. 278.

at the total array shows that the largest coefficients are to be found in the control group (own children) and for the hereditary factors, predominantly.

ii. *Influence of Specific Environmental Factors on Specific Mental Operations (as versus "General Intelligence")*

VERBAL ABILITY

What Van Alstyne (205) did at the three-year level on the relation between verbal ability, a specific function, and certain factors of environment, might well be continued for subsequent levels; for children of different social levels, and for a great many other "elements of environment" than those which she considered, and for their influence on other separate "mental functions" as well as on verbal ability in particular, and on "general intelligence" *in toto*. It may well turn out that some traits, for instance, as "mental speed," are more closely linked to environmental influences and development than are others, such, for example, as "sense of spatial relations," which may be largely a function of genetic constitution.

Kelley (100) and others have attempted to isolate the possible effect of various specific environmental factors on the development of "general intelligence" and on some of the isolated "traits." Statistical analysis of the effect of various such factors will call for more and more accurate measuring instruments of these same factors as fast as they are identified as being of possible significance. One of the earliest "traits" to be singled out, namely, verbal ability, was subjected to investigation for possible developmental determinants (174), and found to be closely dependent on home stimulation, quite apart from intelligence or school attendance, *per se*.

Environmental Handicap and Performance on Stanford-Binet Subtests

Jones, *et al.* (98), have undertaken a study to see whether "rural retardation is due chiefly to educative factors within our control, to general cultural factors, or to the effects of selection." They approach their problem then with a two-fold possibility in mind; namely, the tendency for cities to drain off the better minds, or the possible discriminative handicap of a rural environment in lowering the scores of country children. We report this study here because of the analysis made of the effect of restricted environ-



ment on the separate mental operations in the Binet test, rather than on the composite "test intelligence." These workers studied also whether such handicap was cumulative or transitory. Their findings are most interesting and will be here summarized:

Performance on these sub-test items was studied for three distinct groups, all white and native born; 351 rural New England children, 921 urban children on whom the Stanford-Binet had been standardized; 212 urban children selected from the upper social levels.

There were widely varying differences between urban and rural groups and many sub-tests were "out of level" for the rural group. The conclusion followed that "equal units" of a psychological scale are strictly relative to the sample, and that a test scaled on one group may show marked inequalities or distortion when applied to other groups." (p. 78.) (*Cf.* our discussion, p. 41 f.)

Reliable differences in difficulty for the two groups were found—the urbans being superior in the following sub-tests:

IV—4. Copy square	X—6. 60 words
VII—3. 5 digits	XII—1. Vocabulary 40
X—1. Vocabulary 30	XII—6. 5 digits reversed

In terms of age level of placement, ten other tests showed urban superiority:

V—5. Patience	IX—1. Date
VI—4. Comprehension, 2nd	IX—4. 4 digits reversed
VI—5. Coins	XII—2. Abstract words
VIII—1. Ball and field	XII—4. Dissected sentences
VIII—6. Vocabulary 20	XII—8. Similarities

(p. 79)

The above tests show the functions in which rural children are most retarded. The question raised is: Is the retardation in each case due to rural environmental handicap or to real differences in native ability? Jones, *et al.*, take up each test one by one and examine it from the point of view of difference in opportunity for the two groups to acquire the skill called for.

They conclude:

"... the rural inferiority in I.Q. is due partly, although not wholly, to environmental factors; the environmental handicap is specific rather than general; specific handicaps are those which relate to limitations in the material environment, to lack of adaptability to certain arbitrary test requirements (as in speed tests) and to lack of language information." (p. 83)

Data were analyzed from children who had unusually fine urban advantage, to see whether this advantage was revealed by differences between them and ordinary urban children on those sub-tests in which city and country children showed the most marked differences. These data confirmed the earlier findings.

The particular tests which seemed most susceptible to environmental handicap, as judged by differences in response of the above three groups, were: Vocabulary knowledge; ability to give at least sixty words in three minutes; definition of abstract words; rearranging scrambled words to make a sentence; and ability to detect similarities between two (or three) items, having some element in common.

The environmental advantage of superior urban life on these specific mental processes (all largely verbal) is borne out in the differences to be found between average-urban and superior-urban children. Jones' table is set down below:

TABLE 64

STANFORD-BINET SUB-TESTS, SHOWING A HEIGHTENED DIFFERENTIATION BETWEEN THREE GROUPS: RURAL, URBAN AND SUPERIOR URBAN \*

No. of S.-B. Test	Stanford-Binet Sub-test	Average Difference Indices	
		Rural-Urban	Urban-Superior
VIII-6.....	Vocabulary (20)	2.63	2.92
X-1.....	Vocabulary (30)	3.88	3.84
X-6.....	60 words in 3 minutes	3.17	1.72
XII-1.....	Vocabulary (40)	3.65	3.97
XII-2.....	Abstract words, definitions	2.43	6.80
XII-4.....	Dissected sentences	2.14	2.68
XII-8.....	Similarities	2.21	2.96

\* From Jones, Conrad, Blanchard, 98, p. 92.

Another set of data, consisting of responses given to certain performance tests, not involving the use of language, showed that the rural children were superior on a form board involving rural content (Mare and Foal Test) and inferior on other tests.

We can do no better at this juncture than to quote the summary drawn up by Jones, *et al.* (98):

"In summary, then, it is inferred that a rural child moving to the city would increase his intelligence test scores, merely as a result of changed environmental conditions. The environmental handicap of the rural child is derived chiefly from specific limitations in the material environment, and from social differences which achieve expression in linguistic information and skill, in the speed of test performance, and in adaptation to test situations. The handicap is specific, not general; depending on the test items, it is sometimes transitory, but more often cumulative; the cumulative effect is sometimes in the direction of

diminution, sometimes in the direction of increase of handicap. It is unsafe, however, to infer that the *average* retardation of rural children is chiefly due to environmental factors. The quantitative relations cannot be stated on the basis of the present evidence, but the most likely estimate would be that about half of the average difference of ten points I.Q. is attributable to factors other than those derived from the social and educational environment. Certainly within a rural or urban group, the validity of the I.Q. in measuring native differences is dependent upon the social and educational homogeneity of the group. For whether or not the I.Q. itself is constant, it is fairly clear that its meaning is inconstant: as ages change, and as the homogeneity of groups changes, individual differences in I.Q. will represent changing degrees of relative hereditary and environmental influences. *Nature-nurture inquiries of a fundamental character can in the future be conducted more profitably on the basis of specific tests, rather than on the general composites represented in I.Q. or M.A.*" (p. 96) (Italics ours) \*

#### NEXT STEPS IN RESEARCH OF INFLUENCE OF ENVIRONMENT ON SPECIFIC MENTAL FUNCTIONS

It is to be hoped that this initial study of Jones and his co-workers will be followed by other investigations to determine whether an attained difference between two groups represents actual distinction in native ability, or an invalidity of the test for one group. Such a finding was reported earlier by Shimberg (178) in regard to the matter of special information and knowledge. Since mental content of the sort measured by Shimberg can scarcely be considered as a separate "mental function" or "unique trait," Shimberg's study is not reported here in detail. But her method of attack might well be pursued with regard to environmental influence on special mental traits, as fast as these are identified by students in that field. (Kelley, Spearman, Allport, and others.)

Parallel with the discovery of mental unique traits must be the isolation of specific environmental variables, and the development of scales for their measurement. Beginnings have already been made. [Sims (180), Paterson, Elliott, *et al.* (144)] Only with accurate tools of measurement, both of the specific mental function and the specific environmental factors considered, can the dependence of these variables on each other be evaluated.

#### BRIEF SUMMARY OF INFLUENCE OF CULTURE FACTORS

The preceding survey of studies which investigate the influence of cultural factors (whether general or specific), in shaping the

\* From Jones, H. E. *et al.* Environmental handicap in mental test performance. *Univ. Calif. Publ. Psychol.*, 1932, 5.



development of test intelligence (whether as composite or as special sub-test), does not exhaust research in this field; but it has aimed to cover the more important contributions, and the conclusions reached by these sample studies reflect the general trend of the evidence submitted by all the studies—namely, that intelligence needs a certain adequate minimum cultural environment for its development; that this development is not readily affected by *ordinary* changes in such environment; and that the average I.Q. will respond by fluctuation only to *pronounced* changes in the cultural background; that there is considerably less response to changes in “schooling” than to changes in the cultural background of the home, doubtless because in spite of wide variability of home status, the type of formal education offered, at least to American children, is more or less a “constant” for all. Evidence also accrues to suggest that if change in I.Q. is to be looked for, pronounced changes must be made when children are very young; that the new cultural influence is to be *maintained* over a period of years, if change is to be permanent.

Recent studies suggest that the influence of cultural background may vary for different mental functions, the correlation between home status and verbal ability (a unique trait) being high; that between variation in home and manipulation of performance material low. It is suggested that further research be directed toward the correspondence between specific environmental factors and the development of separate mental functions.

### *iii. Physical Factors and Test Intelligence*

#### INTRODUCTORY STATEMENT

We shall now consider a group of studies which have been carried out over a period of years on the possible modifying effect on mental ability of changes in the physical structure of the individual, due to the conditions of health and disease, accident, depletion of necessary nourishment, growth and malfunctioning of the organs, and other stimuli or conditions affecting physical development. Formerly, up to a generation or so ago, great stress was placed on the harmful influence on mental development of alcohol, drugs, diseased condition of the tonsils, malnutrition, and the like. Propaganda was launched to combat these evil effects, and the argument of consequent stunted mental growth was offered freely. It is only within the last few years, when definite scientific attempts were made to ascertain *to what degree* these factors harmed the mind,

that the remarkable resistance of the central nervous system to such onslaught has been realized.

The earlier studies were under the handicap of having no adequate instruments to measure mental power, either before or after the interference of the physical factor; they suffered too, because investigators were not trained to the dangers of incautious reasoning, and many conclusions of the *post hoc ergo propter hoc* type have been set down as fact,—as, for example, when it was discovered that feeble-minded children tended to have a larger percentage of physical stigmata than did normal children, causation from one to the other condition was deduced. The argument would tend to run that physical defects produced low grade intelligence, or that dull minds resulted from poor bodies, rather than that both conditions were directly referable to a common cause—a generally deficient organism, which manifested its inadequacy both physically and mentally. The carefully controlled conditions demanded in the scientific study of causation; the introduction of reliable tools of measurement both of mental capacity and of the physical variable; the balanced reasoning of the statistically trained investigator; the tendency to interpret only in the light of all possible complicating causes have all helped to contribute a better and surer knowledge and understanding of the physical influences on intelligence. The work in this field has been ably reviewed by Paterson (143) whose point of view is reflected here.

Two of the earlier studies, which in general are good examples of what not to do, will be reported, for it is to this type of study that we owe our earlier misconceptions of “harm done to the mind.” However, these studies are presented chiefly to indicate to the reader certain “selective” factors which are apt to characterize experimental Subjects, and certain fallacies in deduction which are apt to emanate as generalizations to be applied to the generality of the population.

In 1909 Ayres (6, 7) sought to find out the effect of physical defects on school progress. His subjects were 3,304 New York City school children, aged ten to fourteen years, whom he divided into three ability groups,—dull, normal, and bright, on the basis of their age-grade placement at school. His method of analysis was to calculate the percentage of physical defects found in each group, as recorded in the physical examination. His results are grouped in tabular form.

On the face of the Ayres figures, of course, except in the case of visual defect, children who are rated as “dull” are seen to have

TABLE 65

GROUP DIVIDED ACCORDING TO ABILITY AND % OF EACH DEFECT FOUND \*

Physical Defect	% Dull	Mental Ability % Normal	% Bright
Defective vision .....	24	25	29
Enlarged glands .....	20	13	6
Defective breathing .....	15	11	9
Defective teeth .....	42	40	34
Hypertrophied tonsils .....	26	19	12
Adenoids .....	15	10	6
Other defects .....	21	11	11
No. children examined.....	407	2588	309
Defects per child.....	1.65	1.30	1.07
% of children defective.....	75	73	68

\* After Ayres, 6, p. 125.

a higher percentage of defects than do "normal" or "bright" children. This, however, does not imply that defect *causes* dullness.

### Criticism of Techniques in Early Experimental Studies

Several comments can be made on this early method of investigation (143): (1) Mental ability cannot be measured by age-grade location with any degree of surety since school retardation is not always due to limited intelligence. Actual achievement rather than innate ability to achieve is measured by one's standing at school, since school placement depends on factors other than mental ability, such as lack of energy, emotional instability, poor attentive powers due to low physical endurance, and so on.

(2) Ayres apparently made no allowance for the quality of homes from which the children came, and the home is a strong factor behind both physical condition and mental ability, since children from superior homes are better nourished as a rule, better clothed, better adjusted socially, and brighter mentally than children from poorer homes. If Ayres had analyzed the school records of a group coming from one social class only, this objection would not have intruded.

(3) A three-step classification of mental ability is not fine enough to show significant gradations in relation to any other factor, since there will be a fairly wide array of individual differences within any one mental ability group. It would be much more significant to rank the children in order from brightest to dullest, and then to see how physical defects arranged themselves in relation to these rankings in mental ability. There would probably be almost as many exceptions as relations between quality of mind and body.



(4) The differences found between his three groups are not statistically significant, nor, indeed, are they at all large.

(5) No attention has been paid to the fact that some children have a combination of several physical defects, and that the influence of any one cannot be accounted for as Ayres has tried to do by listing them separately. The deceptive nature of evidence of this sort has, however, been combatted in later studies on influence of physical condition.

Wallin's (208) study on the relation of defective health and "intelligence," prepared for the Oral Hygiene Committee of the National Dental Association, reveals other weaknesses of experimental set-up, analysis, and interpretation. Wallin measured mental ability, not by a standardized intelligence test, but by giving a disparate group of tests for individual mental processes, including: Visual memory (reproduction method); rapidity of thought (verbal associations); speed and accuracy in adding digits; association as measured by the "opposite" test; speed and accuracy of "visual discrimination" as measured by the "A" test. A group of forty grade-repeaters, which dwindled down to twenty-seven, were given intensive training in care and treatment of their teeth. Dental treatment was offered and periodical checks were made by a visiting nurse. The experiment lasted for a year, after which Wallin sought to measure the improvement which such intensive dental treatment might bring. Improvement was noted not only in performance on the test material, but also in the school work, only one child failing of promotion.

Today we would not credit such improvement unreservedly to the one factor of dental care. No thought apparently was given in Wallin's study to the added year of age, to the experience in taking the tests, and to the less tangible factor—an intensive interest on the part of outsiders in the individual children, which might be expected to result in a generally higher psychological tone. This kind of omission might easily be checked by the control group technique.

#### INFLUENCE OF PHYSICAL FACTORS

A few studies will now be discussed, which seem in general to have followed the procedure called for in a scientific experiment, and whose conclusions can be considered on the whole as valid. Various factors have been selected whose influence at one time or another were thought to be directly correlated with mental capacity. Perhaps the oldest, historically, is the question of "sex differences."

## (1) Sex

For generations men have been credited with greater intelligence, on the average, than women. The great achievements of history in art, music, literature, science, statesmanship, war, business, and almost every field of activity calling for acumen and ability, have been quite disproportionately rendered by men. For the occasional woman who has reached distinction among her fellows, society has probably doubled her distinction, because of the very rarity of its occurrence. *Pari passu*, the outstandingness of male achievement over female has been somewhat uncritically assigned to a greater mental power on the part of the male. It is only within the last generation or so that the traditional point of view has been questioned.

With the introduction of the mental test, came distributions of scores, according to sex, on test after test. Yet no differences in "general intelligence," either on the average, or as to variability, could be deduced. [Goddard (75), Courtis (30), Terman (191), Lincoln (115), and many others.] Where sex differences have been noted, it does not necessarily follow that these were innate differences. The social training of the two sexes, social standards, and conventions have resulted in selection of various interests and play activities. Sometimes the content of the test might favor one sex, sometimes the other. A test of "general intelligence" consisting of a variety of elements should be equally fair to both sexes as to experiential content; it is questioned if this has always been the case.

Emphasized differences in background, opportunities for training, *etc.*, must therefore always be taken into account in interpreting such differences as appear in test scores and sub-test content. As Witty and Lehman (222) point out, many studies reporting sex differences are invalid, because the tests used were weighted with material favoring the experiences of one or the other sex; often, too, the groups studied represent different selections from the population at large, as when high school seniors are compared (it being fairly well established that the male drop-outs, due to dullness, are heavier than are the female drop-outs for the same reason). Another fallacy in interpretation may be traced to a limited number of cases, or to inaccurate or ill-chosen statistical procedures, which distort the true facts.

Some investigators have claimed that, even though the sexes do not differ on the average in respect of test intelligence, they do in variabilities; that, in fact, the male shows a wider range of

distribution of individual differences than the female. (201) This would mean that at the extremes of ability (very low and very high) the male extends beyond the female. If this theory is so, it would account for the preponderance of eminent men over eminent women. But other studies have failed to show a greater variability for the male [Goddard (75), Terman (191), Courtis (30), Trabue (202), Fraser (56), Lincoln (115)]. Terman (196) recently reports on his group of gifted children that although the two sexes started out equal at an early age in "general intelligence," they emerged unequal in later adolescence, the higher scores favoring the male. The boys tend to hold their earlier high ranking; the gifted girls do not live up so well to earlier predictions. Thorndike and his co-workers find a difference in variability in favor of the boys on their I.E.R. tests. Their group consisted of 2,500 boys and girls, aged thirteen to eighteen years. The difference seemed to be significant, although not consistent at all the ages represented. The change with age, if valid, might serve to explain the unequal eminence of male over female in the past.

The literature on the subject of sex differences has become so vast, as each new investigator has added his bit, that a full discussion cannot be entered into here. For details the interested reader is referred to the excellent summaries by Woolley (225, 226), by Hollingworth (89, 90), by Allen (1, 2), and by Goodenough (78). Recently Goodenough (78) and Witty and Lehman (222) have outlined some of the complications in interpretations. A promising point of view has been taken by Goodenough who stresses the importance of considering the specific forms of intellectual behavior in which the sexes have been found to be different. These types of performance are not necessarily psychologically unique traits, in the sense discussed on pages 13 f and 97 ff. The most consistently reported sex difference is a slight superiority for the girls in the use and comprehension of speech, in age of first acquiring speech; in size of vocabulary, at least up to the age of six or so; in scores on language content tests throughout school years, up to university levels when the men exceed the women in language tests. In number concepts, arithmetical reasoning, and computation, the girls have a slight initial advantage over the boys; but here too, in high school and college the male average overtakes the female average. In "reproduction and memory processes," the girls are consistently superior to the boys from pre-school through college levels. Tests of "general knowledge and information" seem to favor the boys at all ages reported upon; the same may be said



for mechanical ability and motor skill. Goodenough advocates a more complete study of sex differences in the early ages, before an answer can be given as to whether the sex differences found are due to the influence of social customs, emotional drive, or innate mental patterns.

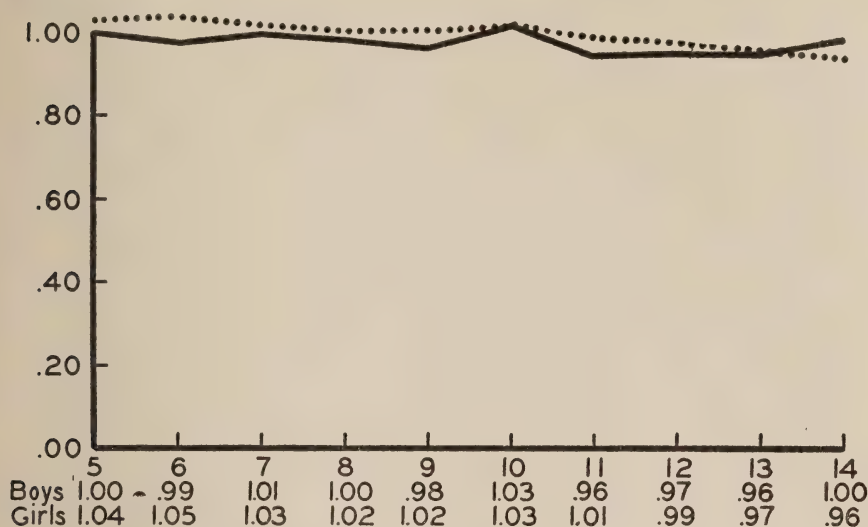


FIG. 28. SEX DIFFERENCES AND I.Q. MEDIAN I.Q. OF 457 BOYS (UNBROKEN LINE) AND 448 GIRLS (DOTTED LINE), FOR AGES FIVE-FOURTEEN YEARS. From Terman, *Measurement of Intelligence*. By permission of, and arrangement with Houghton Mifflin Co.

## (2) Age

The influence of age on intelligence presents a two-fold aspect whose divisions the reader must have rather clearly in mind, namely, (1) absolute intelligence; and (2) intelligence relative to age. The first is usually designated as "mental age," or "levels," attained by children through sheer mental growth from year to year, which mental levels for normal children roughly parallel physical growth up to the age of fourteen to twenty (the upper "roof" not yet fully determined). The second is capacity to learn at any age, or "Intelligence Quotient," which is a matter of relative intelligence or brightness, actual chronological age always being allowed for. We know that the five-year-old can do things impossible to the two-year-old, and that the fourteen-year-old has a higher absolute mental skill than has the ten-year-old; but if we think of one particular child in relation to all of the children of his own age, is his ability equal to, greater than, or less than the average of his same-aged

fellows? It is this latter concept which is covered by the I.Q., and it is the concept of change, or constancy, of the I.Q. which is the basis of the investigations reported in this chapter.

When our most widely used individual test, the Stanford-Binet, received its American standardization and publication in 1916 (1911), the I.Q.'s of the Subjects on whom it had been standardized were distributed for the different year levels. For each age group it was noted that the I.Q. averaged around 100, but it was also noted that those I.Q.'s obtained below age six seemed to run higher than those at subsequent ages, particularly those obtained beyond fourteen years. This has been found to be due in part, to imperfect standardization of the scale, the tests at the lower ages being too easy, enabling the child to earn a high score, and the tests at the upper end too difficult, causing him to earn a lower score than in the intermediate group. It is very difficult to find test material which discriminates between the absolute abilities of the twelve and thirteen-year-old; it is still more difficult to separate the sixteen from the fifteen-year-old, but with a new revision and publication of the scale by the Stanford psychologists no doubt these difficulties will have been met successfully and a more even scale will be offered. The tendency for I.Q.'s to decrease with age, through use of the present revision, should always be considered in the light of imperfection of the measuring instrument. Experimental data on the age factor in I.Q. gathered from any research, must allow for the original weakness of the Stanford-Binet scale; to be significant the decrements from year to year for any group must be greater than for the group on whom the scale was standardized.

Findings of the sort alluded to,—that is, a drop, in I.Q. from early to later ages,—have been noted by Terman (196), Burt (20), Wechsler (209), Jones, *et al.* (98) and others. This tendency has complicated findings of such workers as Jones-Carr-Saunders (97) and Freeman (125).

### (3) Physical Growth and Mental Status for Children Within Any One Age Group

Many studies have been undertaken to find out the relationship between the size and development of the physical organism and mental capacity. Different investigators have had their own techniques for evaluating physical development, some of these being peculiar to the investigator, some being made by acceptable anthropometric, anatomic, and physiological instruments, some connoting physical status under an isolated factor or two—such as

weight, or weight-height index; and many depending for their measure on that more or less standardized report known as "examination by a physician."

The study to be reported here was selected as representing a typical experimental set-up, yielding conclusions in harmony with the majority of research in this field.

Kempf and Collins (193) obtained measurements on 5,160 children in Grades I through VIII, selected from two counties in northern and southern Illinois. Intelligence was measured in the first three grades by the Otis Primary Group test; in the next five grades by the Haggerty Group Test; and to all children who were three or more years retarded, or who fell below 70 I.Q. on the group test, the Stanford-Binet was administered. Physical growth was rated on the basis of measurements made by physicians for weight, standing and sitting height, vital capacity, transverse and antero-posterior chest diameters, length and breadth of head.

Vital capacity was measured by the Sanborn wet spirometer to the nearest tenth of a liter; the chest measurements were made in millimeters by the large spreading compasses of Hrdlička, and head measurements were taken by his small calipers. Hrdlička's procedure (1919, pp. 283-319) was followed throughout. Sitting height was measured according to Dreyer (1920).

The conclusions reached by Kempf and Collins (193) are set down in their tables and graphs (No. 21 to 24, and Graphs 11 A, B and 12), and although some consistent but slight advantage was found in the case of weight, vital capacity, standing and sitting heights, for children of high I.Q. over those of the same age but with I.Q. less than 90, no differences were found between different ability groups for ratio of head nodule to standing height.

The generalization might be summed up to state that *on the average* there is a slight physical superiority for groups characterized by mental superiority, but that within either group there is considerable *variation* among individuals. Similar findings are reported by other investigators. (189)

#### (4) Physical Condition and Mental Status

##### Freedom from Physical Defect

This investigation, also undertaken by Kempf and Collins (193), on the same group of children, is concerned not so much with general physical growth as with freedom from physical defect. Examinations for defects were made by three different doctors and



to eliminate the unreliability of varying diagnostic standards, each doctor's group is reported separately. Groups were divided according to I.Q. levels, and percentage of such defects ascertained for each level; also average number of physical defects per child in each I.Q. group.

Conclusions were summed up in their tables (Nos. 16 to 19), and their charts (8 to 9-a, 9-b and 10).

As the I.Q. increases, the number of physical defects per child decreases. This tendency was independent of the race, language, and similar social background of the child. On the average, children of inferior ability tended to have a larger number of defects than children of average ability. Hearing was the only defect which individually seemed to bear any close relation to I.Q.

Kempf and Collins interpret their findings in several ways, as follows: (a) The handicap of having physical defect may retard mental development; (b) children of low mental development may tend to come from families of somewhat inferior innate constitutional physical characteristics; (c) both factors, physical and mental inferiority, may be the result of other factors, adverse conditions, *etc.*, which are correlated with them. (p. 1783)

It is difficult to argue from the presence of two concomitant variables that one is cause and one is effect. It is not possible to secure mental test ratings both before and after the physical handicap or defect has manifested itself. To note its possible modifying influences a different experimental attack can be made, however, in that it is sometimes possible to give a mental test during the appearance of the defect, remove the defect, allow time for operative or convalescent recovery, and then re-test. This is the approach made by Hoefer and Hardy in their contribution to the "*Twenty-seventh Yearbook.*"

In this study (125) three series of examinations were made a year apart. At the end of the three-year experimental period of health education and supervision, the children were divided into four groups according to the improvement shown: Good, improved, poorer, and fair to poor; and the degree of physical gain was studied in relation to mental gain on test (if any).

There were 343 children, ages eight to eleven, from Grades 3 B and 4 B of twelve different schools; all were white, American born, and had I.Q.'s over 75. Intelligence was measured by the Stanford-Binet at the beginning of each year period, and physical condition was judged from four points of view: (1) General condition based on physician's examination; (2) condition of tonsils; (3) accelera-

tion or retardation of growth in: (a) Strength of grip, (b) breadth of shoulders, (c) weight/height proportion, and (d) the habit of coffee-drinking.

Conclusions were largely negative. There were no reliable differences between the four physical groups as far as gains in I.Q. were concerned, nor was any relation found between physical growth and intelligence. Interesting enough was the finding that those who did not drink coffee tested higher on the average than did those who drank it; but the investigators warily comment that this habit may be symptomatic of other common factors which go with the status of the home, and also that mental improvement for the non-coffee drinkers may not be due to the control of coffee *per se*, but to the entire health control and cultural status of the home, of which this is but one aspect.

### Psychopathic Condition and Test Intelligence

The tendency for superior qualities of different sorts, manifested in many fields of activity—physical, social, aesthetic, and mental—seems to be inherent in what Hollingworth (84) terms a certain “quality of the organism,” which resists imperfections. Thorndike (201, p. 362ff.) has expressed the same idea in holding that correlation rather than compensation is the rule.

“Nature does not balance feeble-mindedness by great manual dexterity, nor semi-insane eccentricities by great courage and kindliness. Correlation of divergences up or down from mediocrity is the rule, not compensation. The child of good reasoning powers has better, not worse, memory than the average; the child superior in observation is superior in inference; scholarship is prophetic of success out of school; a good mind means a better than average character.”

“Selective breeding for superior intelligence and character does not then require great skill to avoid injurious by-products or correlations of intrinsically good traits. *Intrinsically good traits have also good correlatives.*” (p. 131)

Terman (195) and Cox (31) too, found a tendency for desirable traits, such as general intelligence, originality, sense of humor, conscientiousness, leadership, perseverance, *etc.*, to go together, as illustrated in their investigation of gifted children. On the other end of the scale, students have noted a larger incidence of physical stigmata among the mentality retarded than among the mentally normal.

As pointed out on pages 15 ff and 38 of this book, Gesell emphasizes the parallel development, at the younger ages, almost the mutual interdependence of mental and physical maturation,

reflecting a point of view somewhat similar to Hollingworth's "quality of the organism" theory. Yet elsewhere (*Cf.* p. 312) of this book) he brings out the specificity of growth of the nervous system, which tends to grow "in obedience to pattern," relatively independently of the general growth of the somatic organism which it inhabits. Probably, if the truth were known, both points of view are right; there may be general factors, plus specific factors in growth (95). Here one is reminded of the stand taken by Spearman with respect to the nature of intelligence (page 12), and of Hartshorne and May with respect to personality. The time will come undoubtedly when statistical credit will be given both to the general quality of the organism and to the part played by specific qualitative factors independent of the general factors, which determine developmental expression in any isolated activity or trait.

To the general findings of a high correlation between good physical and good mental traits, a counter viewpoint is held as expressed in the old Dryden couplet:

"Great wits are sure to madness near allied,  
And thin partitions do their bounds divide."

In a critical article, Lehman and Witty (221) hold that: "Genius and neuroses are perhaps never very far apart, and in many instances are expressions of the same tendency." In a review of the literature extending back to Galton, they find the prevailing opinion to be that those who are "extremely active in mind, most often possess brains that are more excitable and peculiar than is consistent with soundness."

Frink's point of view especially is dwelt upon, namely, that normal people have no difficulties in adjusting to their environment, because they are as a rule too "sleek in their own contentment to fight hard for any radical changes." Such fighting endeavor requires the "constant stimulus of a chronic discontent," which Frink thinks may be often neuropathic in origin.

To this the present writer would suggest that the solution of the two opposing points of view may lie in the fact that discontent and instability grow out of the struggle of the highly intelligent individuals to adjust themselves to a world geared for the average mind. Terman found (195) as did Hollingworth (91), that highly gifted children began their life rather well adjusted. Witty and Lehman point out the continual evidence of instability and maladjustment among highly gifted adults. May it not be that the needs and dissatisfactions of the highly gifted, becoming more and



more articulate with age and experience, result in later breakdown? Just as the mental defective's efforts to meet the demands of a society keyed too high for him, so, too, may the genius' inability to adapt to a world keyed too low for him, operate in producing psychopathy. This point of view does not preclude the acceptance of both general and specific factors influencing final outcome.

Of interest here is Seashore's (175) comment, because when "genius" is referred to, the popular mind does not ordinarily distinguish between intellectual and emotional achievement or inspiration:

"Great achievements on the intellectual side tend to balance a man, whereas great achievement within narrowly emotional performance tends to distort perspective; an emotion, being a relatively severe drain on the nervous energy, weakens the power of self-control and produces an abnormal sensitiveness. Many successful artists have been notorious for their violation of these homely virtues." (p. 270)

A large incidence of neurosis to be found among men of genius (111) is in itself not proof of relationship. The question is rather whether there is a larger proportion for this group than for the general run of mankind. For experimental research the reader is referred to two investigations by Schott (170, 171). In one he reports that the curve of distribution of Stanford-Binet I.Q.'s for his 450 neuro-psychiatric patients at the Ford Hospital, Detroit, followed closely the curve of the population at large, indicating that there was no greater percentage of high I.Q.'s among the victims of mental and nervous diseases than among the normal group outside of hospitals. In his other article, Schott reports the results of retesting fifty adult psychiatric patients and fifty behavior problem children. The correlation coefficient between first and second tests for the adults was .868; for children .956; for both groups .907. The average variability for adults was 7.58 I.Q. points; for the children 4.68 I.Q. points. This, it will be seen, compares very favorably with the normal variability between test and re-test, as reported in our Chapter I (pp. 51ff) on constancy of I.Q. findings. These similar results would indicate that experimentally at least no direct relation between psychopathy and test intelligence has been noted.

Studies of mental disorder among men of genius have been reported upon by many writers from Lombroso to Kretschmer (109). The matter should be of peculiar interest and importance to eugenicists, and is well worthy of intensive research, whether genius be considered in Terman's rather narrow interpretation as

being mental ability "above I.Q. 140," or whether it be used in the more popular conception to cover men who have achieved outstanding distinction and fame, especially in the artistic and scientific fields.

### (5) Pubescence and Mental Maturation

Intimately allied with the concept of physical growth is that of physical maturation or puberty. There has existed among the laity a notion that early physical maturity implied mental acceleration. But Stone and Doe-Kuhlman (125) in a thorough-going review of the medical literature on the subject, covering over half a century down to 1928, fail to find any evidence of increased mental attainment with early puberty. If anything, the rate of mental development for these clinical cases has veered toward retardation.

#### Precocious Puberty

Gesell (125) reports in detail on two cases of pronounced precocious puberty, the one maturing at three years, seven months, the other at eight years, three months. In the case of the second girl, two mental records prior to the onset of puberty had been obtained, and two records following it. If there is such a thing as an "adolescent spurt" in intelligence, Gesell points out that these two cases should show a trend in that direction; but he finds none. His comment is interesting:

"There is a high degree of specificity even of independence in the components of the growth complex. Pubescence plays its part but not with unlimited autocracy.

The nervous system, among all the organs of the body, manifests a high degree of autonomy, in spite of its great impressionability. . . . It tends to grow in obedience to inborn determiners, whether saddled with handicaps or favored with opportunity." (p. 408f)

#### Variations in Pubescence Within the Normal Range

Viteles (207) has sought to find out "the extent to which early maturity confers a benefit in the way of superior mental status." He correlated age of puberty with scores of 236 Normal School girls on the Brown University Psychological Examination. These girls, ranging in age from fifteen years eleven months, to twenty-four years, were all sexually mature at the time the study was made. Viteles' analysis of data consisted in distributing these records in five groups according to age of pubescence. He also compared data for the extremes—early and late ages of puberty—and computed the coefficient of correlation between these variables.

The coefficient between age of puberty and intelligence was  $.01 \pm .043$ ; with age held constant it was  $.02$ , showing no parallelism whatever. Some of his data are summed up in the table below, showing no reliable mental differences between the early and late maturing girls.

TABLE 66

COMPARISON OF PHYSIOLOGICALLY ACCELERATED AND RETARDED NORMAL SCHOOL STUDENTS \*

Age of Pubescence Range in Years	No. Cases	Average Age of Pubescence and S.D.	Average C.A.	Average B.U. Intell.	Average Grade 1st Term
9.0 to 11.11 (accelerated) ..	16	$10.00 \pm 0.91$	$18.4 \pm 1.7$	$47.8 \pm 13.4$	$82.2 \pm 4.4$
15.1 to 17.6 (retarded) ...	14	$16.00 \pm 0.64$	$18.6 \pm 1.35$	$47.4 \pm 5.9$	$81.5 \pm 3.7$
Entire group .....	236	$13.56 \pm 1.25$	$18.3 \pm 1.25$	$46.2 \pm 8.88$	$81.6 \pm 4.08$
Difference (accelerated- retarded) .....		-5.1	-.20	+.40	+.70
S.D. Difference .....		1.74	.55	3.7	1.48
Difference .....					
S.D. difference .....		2.9	.36	.13	.47

\* From Viteles, 207, p. 366.

#### Viteles comments:

"The findings of the present investigation suggest that those who mature late profit from this spurt equally as much as those who mature early, the effect of the spurt in the two groups being equalized as adult life is approached." (p. 367)

#### (6) Malnutrition and Test Intelligence

At one time it was thought and felt that the intelligence of the undernourished child was below that of the normally nourished child; hence, reversing the argument, it was claimed that by feeding these children who were under a nutritional par, an increase in intelligence could be looked for. A number of experimental studies have been reported, ranging all the way from the extreme malnutrition suffered by children in Germany during the war period (reported by Blanton, 1919) to a relatively mild degree of underweightness observed in clinical and school children under carefully controlled conditions.

A report of the Blanton (17) type is highly worth while because of the pronounced degree of malnutrition which affected the children; its chief weakness, however, lies in the fact that other experimental variables, under existing conditions, could not be set up and controlled for their interlocking influence. Blanton was forced to analyze results of tests and interview impressions of the intelligence of children, *after* the condition of malnutrition had had a chance to act. He compared post-war results as he found them



PERCENTAGE OF DISTRIBUTION  
OF CHILDREN ACCORDING TO  
INTELLIGENCE FROM "MEASURE-  
MENT OF INTELLIGENCE" BY  
PROF. LEWIS M. TERMAN

CHANGES IN DISTRIBUTION OF  
INTELLIGENCE DUE TO  
MALNUTRITION

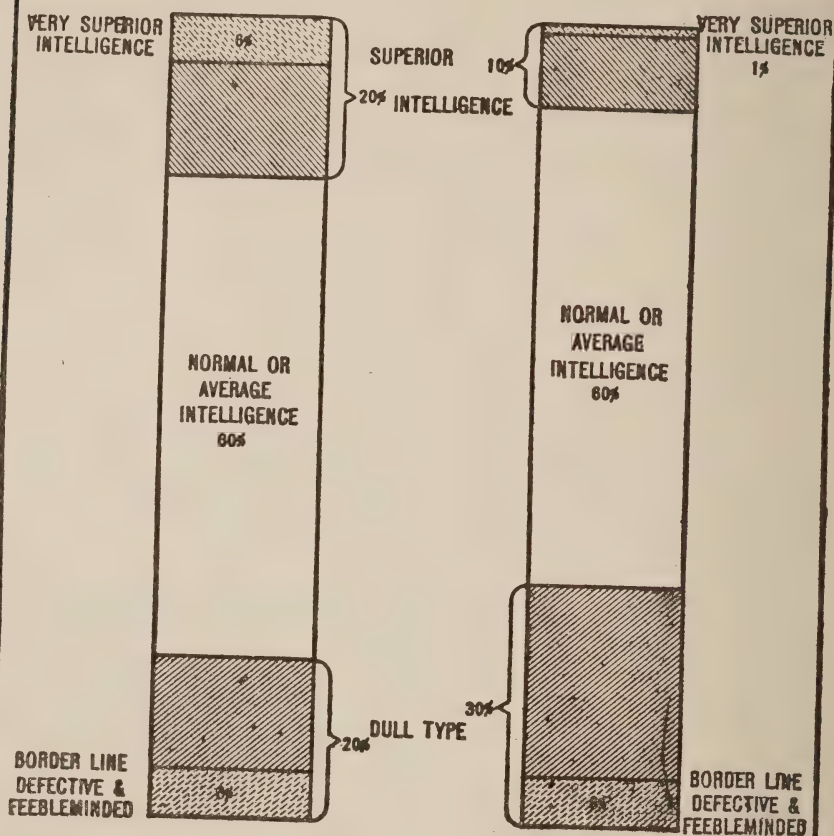


FIG. 29. CHANGES IN DISTRIBUTION OF INTELLIGENCE IN RELATION TO MALNUTRITION. From S. Blanton, *Changes in distribution of intelligence in relation to malnutrition*. *Mental Hygiene*, 1919, p. 378. Courtesy of Nat. Comm. of Mental Hygiene.

in Trier, Germany, with the "normal expectancy" of I.Q. distribution as set down by Terman, 1916, for children in America brought up under normal conditions. Blanton's chart is reproduced on page 314.

Blanton's conclusions that not more than five per cent of the total school population suffered enough permanent injury to their nervous system to leave scars on their I.Q. is illuminating. Other damage, such as emotional unbalance, was conceded as an after effect of malnutrition, but intelligence, during a two-to-four-year period of extreme malnutrition, was practically unimpaired. It is interesting to note also that children of inferior stock to begin with, suffered more lowering of intelligence than did children of normal or superior stock, and that for these inferior individuals a moderate degree of malnutrition was often sufficient to bring about a change.

Later experimental studies by Hunt, Johnson and Lincoln (93), by Dowd (41), by Nicholls (139) and by Stalnaker (185), merely reinforce the point of view that an I.Q. cannot be bolstered up by food, and that undernourished children, whatever their other handicap, are no whit inferior mentally to well nourished children of the same race and social status, and that correcting the underweight condition, although it results in a happier, more active, and stable child, does not result in a brighter one.

More recently (1927) a study was undertaken on the relation of nutritional condition, not only to I.Q., but to the social status of the children (as represented by parental occupation). Stoke (189) found that when he ranked his five occupational groups according to their freedom from malnutrition (criterion being ten per cent under weight for height) the order was: I, IV, V, III, II. These numbers refer to classification on the Taussig scale, I being the lowest socially, *i.e.* the day laborers, and V the well-to-do. As Stoke comments: "Apparently good or bad nutrition does not seem connected in any way with the type of occupation followed by the parent." (p. 88)

### (7) Glandular Deficiencies and the I.Q.

Within recent years much has been said and hoped for on the therapeutic value of glandular extracts in making up for individual developmental depletion. Studies have been reported by Stocks, Stocks and Karn (188) on the relation between the size of thyroid gland and physical and mental development; by Oleson and Fernald (140) on the relation between endemic goiter and intelligence;

and by Schlapp (169), by Fox (55), and by Marinus and Kimball (120), on the effects of glandular therapy on the I.Q.

TABLE 67

DISTRIBUTION OF 182 CASES, ACCORDING TO GLANDULAR GROUP, SEX, MINIMUM, MAXIMUM, AND AVERAGE I.Q.\*

Glandular Group	Boys	Girls	Total	I.Q.		
				Min.	Max.	Average
Hypothyroid .....	83	18	101	33	115	75
Hyperthyroid .....	1	2	3	59	94	81
Hypopituitary .....	16	7	23	30	110	74
Hyperpituitary .....	2	0	2	52	61	57
Thyro-pituitary .....	2	1	3	71	90	77
Pluriglandular .....	8	42	50	30	108	71
	112	70	182			

\* From Fox, 55, pp. 96, 97.

In regard to the first set of studies, the findings are again generally negative. Whether judged by scores on a standardized intelligence test, or by proficiency in school work, there is no evidence that malfunctioning of the thyroid gland and backwardness go together.

TABLE 68

I.Q. CHANGES IN VARIOUS AGE GROUPS (22 CASES)\*

Age	No. of Cases	I.Q. Pts. Lost	I.Q. Pts. Gained	Net Loss or Gain	Average Loss or Gain
8 and 9 years.....	6	13	16	3	0.5
10 and 11 .....	5	16	3	-13	-0.26
12 and 13 .....	7	12	40	28	4.00
14 and 15 .....	4	2	18	16	4.00

\* From Fox, 55, p. 99.

In regard to the matter of administering corrective glandular treatment, Schlapp (169) cites a few clinical cases and stresses the point that such treatment, to be effective, must be given early. He does not have enough cases from which to make reliable generalizations, but if there is a direct correlation between glandular deficiency and retardation, apparently therapy administered late is powerless to bring about a change in intelligence. On this point the reports of Fox, and Marinus and Kimball are clear-cut. Fox found that of the twelve cases, receiving from one-quarter to one grain of thyroid, half showed a lowering of I.Q. on re-test. The average gain for this treatment group was one point, which is, of course, insignificant. Details of the age, glandular make-up, amount of treatment, *etc.*, are set down in tables taken from Fox's report.

Suggestive as they are, Fox's findings are not to be taken as final for several reasons: (1) They are based on too small a group



TABLE 69

## LENGTH OF GLANDULAR TREATMENT AND CHANGE IN I.Q.\*

Duration of Treatment	No. of Cases	I.Q. Pts. Lost	I.Q. Pts. Gained	Net Loss or Gain	Average Loss or Gain
6 months .....	9	9	39	30	3.3
1 year .....	4	5	19	14	3.5
1 yr. 6 mos. ....	1	0	3	3	3
2 years .....	8	29	16	-13	-1.6

The greatest gain in I.Q. is by those whose re-examination occurred within one year after the initial test.

\* From Fox, 55, p. 100.

of Subjects; (2) treatment was given rather late in childhood; (3) the standard of thyroid material is variable in its physiological and therapeutic activity (104) and few samples on the market are found to comply with U. S. Pharmaceutical standards. Most of the glandular therapy in the past has been to give dried extract, dessicated thyroid by mouth, which may be assimilated from zero to 100 per cent, depending upon the person and the conditions. Kendall (104) strongly advises the use of thyroxine to supplant desiccated thyroid, claiming that it produces qualitatively every physiological effect of desiccated thyroid, although quantitatively it may be somewhat less active. Thyroxine is the iodine compound which can be obtained from that fraction of the thyroid protein which is insoluble in acid after alkaline hydrolysis. Thyroxine can be separated as the insoluble barium salt and crystallized from alkaline alcohol by the addition of acetic acid. One awaits further research on mental growth following the administration of this more highly reliable thyroxine.

#### (8) Diseased Tonsils and Adenoids

Less than a generation ago, much was said on the harmful and retarding mental effects which went with diseased tonsils and adenoids. Parents everywhere were cautioned about the danger of their child's school progress if the condition were allowed to persist; mouth-breathing and dullness became almost synonymous terms, and a tonsillar throat was well on the way toward being a stigma against self-respect. Tonsillectomies and adenectomies became the order of the day, and with what result? Better health, increased vitality and greater joy in living, undoubtedly; but keener intellect, no! In 1922 and 1924 two very carefully controlled experiments were carried out by two different investigators, one in New York City and the other in Kentucky, both making use of standardized measurements of intelligence, both employing the test-

retest method before and after operation, and both checking against control groups of children with tonsillar throats, but who had not been operated upon.

Rogers (165) matched twenty-eight children whose tonsils were diseased and removed with twenty-eight children, similarly afflicted, but retaining their tonsils. Re-tests were given to both sets of children six months and twelve months after the initial testing, and individual gains or losses reported. The average gain for the operated group was 3.0 points of I.Q.; for the non-operated group it was actually higher, being 6.2 points I.Q.

Rogers comments:

"Since there was no recuperation in intelligence resulting from operation for adenoids and tonsils, it is reasonable to expect that there had been no retardation from which to recuperate." (p. 69)

This assumption finds support in a further bit of analysis in Rogers' report. The intelligence of a group of 239 children with diseased tonsils was compared with the intelligence of a group of 294 children having normal tonsils. These two group distributions of intelligence are so similar that the curves can be almost superimposed on each other to look as one.

Lowe (117), too, reports similar negative results on change in test intelligence following operation for adenoids and diseased tonsils. The average gain for her thirty-five operated cases was 1.6 points I.Q.; the average gain for the twenty-five controls was 2.2 points I.Q.; both gains being virtually equal. Combining her data with Rogers', Lowe finds an average increase of 2.2 for operated cases; of 4.1 for those not operated upon. Her distribution of individual gains and losses resulting from both studies is set down below.

Clearly, whatever benefits are to be accrued from removal of tonsils and adenoids, increased I.Q. is not one of these.

It has been objected that absence of gain in I.Q. with correctional therapy is no argument against mental injury as a result of the physical ailment; that the harm done by the physical complaint is already complete; mental habits are set, and growth rates in mental ability established. Just as the introduction of decidedly superior home background was less effective in proportion as the child grew older, so the tonsillectomy should be undergone early. Another point to be brought out is the length of time in which the tonsils were diseased before operation. Presumably there may be a relationship. This should be investigated.

TABLE 70

DISTRIBUTION OF CHANGES IN I.Q. BEFORE AND AFTER TONSILLECTOMY \*

Lowe's Data (25 Cases)			Lowe's and Rogers' Data Combined		
I.Q. Change	Operated	Control	I.Q. Change	Operated	Control
17.0-17.9	1	0	26.0-27.9	0	1
16	1	1	24	0	0
15	0	1	22	0	1
14	0	0	20	0	1
13	1	1	18	1	1
12	0	0	16	2	2
11	0	1	14	1	2
10	0	0	12	1	2
9	0	2	10	2	1
8	2	0	8	3	2
7	2	1	6	6	4
6	1	0	4	4	3
5	2	1	2-3.9	8	4
4	2	0	0-1.9	5	5
3	1	2	0-3.9	7	3
2	2	0	2-3.9	7	2
1	1	2	4	4	6
0-.9	1	3	6	1	4
-1.0-1.9	5	2	8	3	1
1	1	0	10	0	0
2	3	0	12	1	1
3	3	1	N	56	46
4	2	4	Avg. increase	2.2	4.1
5	1	1	M.V.	3.8	4.9
6	1	1	M.E.	0.5	0.7
7	0	0			
8	1	0			
9	1	0			
10	0	0			
11	0	0			
12	0	1			
Avg. increase	1.6	2.2			
M.V.	3.9	4.7			
M.E.	0.7	0.9			
Med.	-0.1	0.9			
Q	3.8	4.5			
P.E. Med.	0.6	0.9			
N	35	25			

\* From Lowe, 117, pp. 95 and 98.

### (9) Intestinal Toxemia

One study is reported by Paulsen (145) in connection with the influence of treatment for intestinal toxemia on mental and motor efficiency. Thirty Freshman girls at Battle Creek Sanitarium, all having definite intestinal toxic conditions, were tested before and after treatment by a variety of tests of separate mental and motor processes. During the course of treatment, the Terman Group Test of Mental Ability was administered. The control Subjects were a group of thirty young women in New York City, some being college students, some stenographers. The control group took the



tests of mental and motor processes only once to establish a standard.

Paulsen found that after treatment for toxemia the experimental group registered a gain of nine per cent over the control on the test of mental processes; on the motor tests, this group showed a gain of thirty-four per cent, suggesting that the toxic condition affected mental test efficiency only very slightly, but motor efficiency more markedly.

It is unfortunate that the control Subjects were not drawn from the same student body as were the experimental Subjects; it would also have been desirable to note possible effects on ability to respond to a standardized test of intelligence before and after treatment. Unfortunately, too, the toxic Subjects were told the purpose of the experiment, and this knowledge may have acted to affect test scores. Then, too, differential gains and losses for both groups on two testings would give a better representation of gain which might be due to practice effect, and to sheer growth.

#### (10) Hookworm, and its Effect on Test Intelligence

Smillie and Spencer (181) studied the relationship between the degree of infestation of hookworm and degree of mental retardation. A five-step scale of infestation was used (based on the ova count in the stool) ranging from complete absence of hookworm to a condition of 500 to 1000 worms in the individual child. Mental ability was measured by I.Q.'s obtained on the Otis Group Intelligence and the National Intelligence tests. The Subjects were 118 rural white school children in Grades III to VII of three different rural schools. These children were all white, of American parentage, and living on small farms in a heavily infested hookworm district.

The analysis of data showed clearly that the children with little or no hookworm affliction tested higher mentally than the more afflicted; and that the severest cases of hookworm were the dullest on the mental test. But such correlation, it must be repeated again, does not indicate that the hookworm is the cause of the dullness. To deduce this interpretation the influence of another factor must first be adequately considered; namely, that of selection of cases. Parents of low social status, dull in intelligence, are likely to provide less sanitary homes for their children. The hookworm finds its way more readily into such a situation than into the homes of the more alert who have not only higher hygienic standards of living, but initially brighter children.

These data gathered by Smillie and Spencer (181), and sub-

sequently rearranged by Paterson (143) are set down. Differences between various intensities of hookworm, especially the first four groupings, are very slight and insignificant.

TABLE 71  
I.Q.'S OF VARIOUS HOOKWORM INTENSITY GROUPS \*

Intensity	No. of Cases	Mean I.Q.	S.D.	Coef. of Variation
Negative .....	17	90.2 ± 1.53	9.496 ± 1.10	10.5
Very light infestation (1-25 worms) .....	40	88.3 ± 1.06	9.96 ± .75	11.2
Light infestation (26-100) .....	27	86.4 ± 1.2	9.54 ± .875	11.0
Moderate infestation (101-500) .....	23	84.1 ± 1.07	7.68 ± .76	9.13
Heavy infestation (501-2,000) .....	10	76.3 ± 1.737	8.136 ± 1.22	10.7

\* From Smillie, Spencer, 181, p. 319.

TABLE 72  
OTIS I.Q. IN RELATION TO ESTIMATED INTENSITY OF HOOKWORM INFESTATION \*

Otis I.Q. Range	No. of Cases	Estimated No. of Hookworms per Case
105-115 .....	4	30
95-104 .....	18	47
85- 94 .....	45	67.8
75- 84 .....	36	172
65- 74 .....	15	281

\* From Smillie, Spencer, 181, p. 317.

TABLE 73  
SCATTER TABLE SHOWING RELATION BETWEEN INTENSITY OF HOOKWORM INFESTATION AND OTIS I.Q. FOR 117 CHILDREN \*

Otis I.Q. Range	Intensity of Hookworm Infestation					Negative Cases	Total
	Severe 501-2000 Worms	Moderate 101-500 Worms	Light 26-100 Worms	Very Light 1-25 Worms			
105-115 .....	0	0	1	3		0	4
95-104 .....	1	1	2	6		8	18
85- 94 .....	0	10	16	14		5	45
75- 84 .....	6	10	4	14		2	36
65- 74 .....	3	2	4	3		2	14
Total .....	10	23	27	40		17	117

Pearson r = .30 ± .06

\* Smillie-Spencer data rearranged by Paterson, 143, p. 197.

(11) Orthopedic Handicap: Crippled Children of Various Types

In connection with the mental effects of serious physical handicap of various kinds, we have one careful study to report, which was projected by Fernald and Arlitt (52). Stanford-Binet I.Q.'s

were available for 194 crippled children in an orthopedic hospital and eighty-nine of their siblings. It is of course impossible, in studying such an environmental variable as the onset of disease or accident, to employ the test-retest technique; hence other analytical and interpretative methods were resorted to. Data were grouped in three different ways: (1) According to the nature of the physical handicap as diagnosed; (2) according to the seriousness or degree of handicap as estimated; (3) according to the I.Q.'s of siblings of the crippled children.

TABLE 74

MEAN I.Q.'S OF GROUPS CLASSIFIED BY INITIAL DISEASE OR INJURY \*

Disease Group	No. Cases	Mean I.Q.	S.D.
Poliomyelitis .....	62	83.79	1.63
Spastic Paralysis (birth) .....	27	69.11	3.23
Tuberculosis (joint) .....	35	86.20	2.47
Miscellaneous .....	70	83.57	1.82
Nutritional .....	15	86.53	4.65
Infections .....	17	85.47	3.04
Traumatic .....	18	86.00	4.06
C.N.S. involvement .....	15	75.93	4.34

\* From Fernald and Arlitt, 52, p. 451.

Fernald and Arlitt's conclusions are illuminating: Cripples are in general not mentally different from their physically normal sibs, especially when allowance is made for regression toward the mean. The extent of handicap in interfering with the child's ability to help himself does not produce variation in I.Q.; in other words, the severer cases are not necessarily duller on the mental test, but when handicaps are grouped diagnostically it is found that those cases resulting from a disease of the central nervous system (lues, meningitis, spastic paralysis) are seriously retarded mentally. This group of diseases will be discussed a few pages later. The tabulated data of Fernald and Arlitt are set down below.

TABLE 75

CRIPPLES COMPARED WITH THEIR PHYSICALLY NORMAL SIBS \*

Disease Group	No. Cases	Mean I.Q.	S.D.
Cripples .....	49	83.9	2.7
Sibs (averaged by families) .....	89	82.2	3.2
Difference .....		5.3	

\* From Fernald and Arlitt, 52, p. 452.

## (12) Syphilis and Mental Ability

Perhaps no disease is faced with more concern by the popular or professional mind than the presence of syphilis, and many are



the unfounded deductions drawn as to its responsibility for producing mental deficiency. The next few paragraphs will discuss mental impairment and syphilis, especially congenital syphilis. The discussion on cerebral syphilis and general paresis, a condition of the central nervous system, is referred to page 330.

Dayton (38) summarized the international literature appearing over a twelve-year period on the incidence of congenital syphilis in mental defectives. He compared the total result, in per cent, with the percentage of congenital syphilis among non-defectives, and found virtually no difference in proportion to the whole. (7.8 and 5.3 per cent.) Along with this review he included an analysis of the fifty-seven positive syphilitic defects resident at Wrentham State School, subdividing this group into four sections, each of which might be considered to have sufficient explanation in itself to account for the presence of mental defect. Dayton's data, reproduced in tabular form, show no disproportionate amount of deficiency in the congenital group. Nor does it necessarily follow, even in this group, that it was congenital syphilis which brought about mental deficiency.

TABLE 76

SUMMARY OF LITERATURE SHOWING INCIDENCE OF CONGENITAL SYPHILIS IN DEFECTIVES \*

Author	Location of Study	Year	Number Examined	Positive Wassermann	
				No.	Per Cent
Key .....	Australia	1922	217	120	55.2
Boas .....	Denmark	1911	2,061	31	1.5
Chislett, etc. ....	England	1911, '12, '13	144	68	47.2
Raviart .....	France	1909	246	76	30.0
10 different investigators	Germany	1909-1913	2,035	280	13.7
14 different investigators	United States	1910-1920	9,058	494	5.4
Total .....			13,761	1,069	7.8

\* From Dayton, 38, p. 763.

TABLE 77

INCIDENCE OF CONGENITAL SYPHILIS IN NON-DEFECTIVES \*

Author	Location of Study	Year	Number Examined	Positive Wassermann	
				No.	Per Cent
Casaubon .....	Argentina	1922	6,678	400	6.0
Davidson .....	Australia	1909	448	48	10.8
Morgan .....	Canada	1920	725	29	4.0
Browning and Elliott..	England	1914	461	47	10.8
Rabinowitch .....	Germany	1913	1,108	153	13.8
13 investigations .....	United States	1912-1921	16,156	699	4.3
Total .....			25,576	1,376	5.3

\* From Dayton, 38, p. 765.

TABLE 78

ANALYSIS OF THE POSITIVE WASSERMANN CASES AT WRENTHAM STATE SCHOOL \*

Group	N	% of 1,631 Cases		
		Examined	Male	Female
1. Acquired syphilis .....	7	0.4	0	7
2. Mental deficiency in heredity.....	15	0.9	3	12
3. Mental disease in heredity.....	7	0.4	2	5
4. Congenital syphilis, only .....	28	1.7	10	18
Entire positive group .....	57	3.4	15	42

\* From Dayton, 38, p. 768.

Dayton (38) concludes:

"This analysis and its resulting figures, tend to revise our estimate of syphilis as a cause of mental deficiency and to place this disease among the negligible factors." (p. 769)

Myerson (124), reviewing several studies, reports that Weiss and Isgur found only 2.7 per cent positive Wassermanns in 1,630 cases in a New York institution for mental defectives; while in the State School for the Feeble-minded at Waverley, Mass., 6.5 per cent were labeled congenital syphilitics.

Other studies, such as that reported in the Army Memoirs (228), have analyzed test scores, made by venereal and non-venereal groups, and have generally found a slightly lower average in test intelligence for the venereal group. This correspondence, of course, in itself proves nothing as to causation. The Army report states:

"Such a difference might be more reasonably interpreted as an indication that men of inferior intelligence are more likely to expose themselves to venereal infection, or less likely to employ suitable prophylactic measures." (p. 811)

The reader interested in a more detailed presentation of sequelae of syphilis is referred to the work by Solomon and Solomon on *Syphilis of the Innocent* (183).

### (13) Allergy and Test Intelligence

The fact that asthmatic children, whose affliction compels them to be out of school from a third to a half of their time, still seem to pass their school grades regularly, prompted Balyeat (12) to investigate the general health and mental activity of allergic children. The Otis-Terman I.Q.'s of these children were studied in relation to those of a group of non-allergic children from the same schools, and it was found that none of the positive allergic skin

reaction cases were sub-normal, although ten per cent of the control group were. At the other end of the distribution, in the "superior," "very superior," or "near genius" groups, Balyeat located seventy per cent of the hypersensitive pupils, and but twenty-five per cent of the well pupils. His data suggest that positive cutaneous hypersensitivity indicates a two to one probability of superior mental capacity. The explanation is not offered, but it is suggested that there may be a correlation between increasing brain development and complexity of cellular tissue.\*

Whatever the reason for this tendency for asthmatic children to be superior mentally, the conclusion is forced upon us that children suffering from allergy conditions and its resulting loss of school experience and instruction, are not handicapped mentally and educationally in relation to their fellows.

#### (14) Deafness and Intelligence

Pintner (37, 154-158), more than any other single worker in the field, has contributed to our knowledge of the psychology of the deaf. Both as a result of his own experimental researches with the deaf and from a review of other workers, he presents two definite findings: (1) The deaf are exceedingly deficient in their ability to comprehend and handle printed and written language; and (2) as a group, they are generally inferior mentally, when tested.

This is not to be wondered at, as Pintner (156) points out. The deaf child does not have the normal medium for acquiring a vocabulary, for developing and expressing his ideas in terms of words—which particular type of symbolism is the basis of our abstractions. Pintner also reminds us that for the deaf, language is an *acquired habit*, a subject-matter course, which has to be learned deliberately, rather than incidentally, as is the case with normally hearing children.

Pintner (156) finds that the congenitally deaf child is on the average two or three years retarded in mental development, and four or five years in language ability. The adventitiously deaf are handicapped in proportion to the age of onset of deafness and the length of time elapsed since this cutting off from hearing contact with the world. He also finds that their discrepancy in educational

\* One is reminded in this connection, of the work of certain German psychologists, particularly of W. R. Jaensch, on the relation between various intellectual characteristics and skin characteristics. Owing to the confused state of the literature on this subject, it will not be discussed here, but as a point of departure for future research on relations between "mind and body" it is highly interesting.



achievement is much greater than in intelligence as compared with the normally hearing.

TABLE 79

COMPARISON OF DEAF AND HEARING IN SCORES ON THE PINTNER  
NON-LANGUAGE TEST \*

Mental Test	Age			
	12	13	14	15
Average of hearing .....	321.	348.	362.	364.
Average of deaf .....	257.7	275.6	300.5	320.1
Difference .....	63.3	72.4	61.5	43.9
S.D. of difference .....	5.22	5.32	5.31	6.13
Ratio .....	12.12	13.59	11.59	7.16
Educational Test				
Average of hearing .....	55.	62.	64.	65.
Average of deaf .....	15.8	19.2	22.8	27.4
Difference .....	39.2	42.8	42.2	37.6
S.D. of difference .....	.83	.86	.87	1.13
Ratio .....	46.89	46.48	47.03	33.24

\* From Pintner, R. *Intelligence testing*. Holt, 1931. P. 411.

Pintner comments:

"A study of the table shows us that at all four ages the hearing are decidedly superior to the deaf and that the differences between the means are statistically reliable. Another way of comparing the two groups is to interpret the means of the deaf in terms of the hearing norms. The mean score of the twelve year old deaf is 258, and this is about the mean for the ten year old hearing, and from this we may calculate an I.Q. of 83. Hence we have:

TABLE 80

MENTAL AGES, EDUCATIONAL AGES, I.Q.'S AND E.Q.'S OF DEAF EXPRESSED IN TERMS  
OF HEARING EQUIVALENTS \*

Mental Age			Educational Age		
Deaf	Hearing Equivalent	I.Q.	Deaf	Hearing Equivalent	E.Q. of Deaf
Age 12	10	83	Age 12	7-9	65
13	10.6	81	13	8-1	62
14	11.0	79	14	8-9	63
15	12.0	80	15	9-0	60

\* From Pintner, R. *Intelligence testing*. Holt, P. 411 and p. 416.

Pintner concludes, in regard to general mental ability, that the deaf are from two to three years retarded, and this is best represented by an I.Q. of 80. (p. 411)

Even more marked is the discrepancy between deaf and hearing children in educational scores, as will be noted from the tabular matter on the right of Table 80. Turning the average of the deaf scores on the educational test into hearing equivalents (see above table) and calculating E.Q.'s, Pintner comments:

“This gives us a maximum of an E.Q. of 65. If we compare this with the I.Q. of 80 on an intelligence test, we have a measure of the relatively greater retardation in educational achievement as contrasted with intelligence. This shows very clearly the handicap of deafness in the acquisition of language. Whether the E.Q. of 65 could be brought up to the I.Q. of 80 by more efficient training it is impossible to say.” (p. 416)

Pintner offers also an analysis of his material, showing the degree of mental and educational retardation in relation to the age at which the child became deaf, the greatest handicap of course being found for those who were cut off from the hearing world before language habits had been formed. The older the child was at age of onset of deafness, the higher his I.Q. and E.Q. are likely to be, on the average.

TABLE 81  
MEAN INDICES OF INTELLIGENCE AND EDUCATIONAL TESTS IN RELATION  
TO AGE OF ONSET \*

		Unknown Birth		0	1	2	3	4	5
Number		201	1129	222	259	201	104	75	74
Intelligence	.....	48.46	50.0	49.7	50.5	49.6	51.2	52.7	55.1
Educational	.....	45.5	48.8	47.4	48.1	50.0	51.9	56.3	61.2
		6	7	8	9	10	11	12	13
Number		42	43	33	17	17	6	4	1
Intelligence	.....	51.6	51.5	53.1	56.	56.	53.	53.	50.
Educational	.....	63.6	62.6	63.3	71.	68.	68.	67.	70.

\* From Pintner, R. *Intelligence testing*. Holt, 1931. P. 412 and p. 416.

An interesting point of view, advanced by Pintner, is that the mental inferiority found is not necessarily a result of deafness, but a sequela of the disease which caused the deafness. This viewpoint must not be overlooked “since the two chief causes of adventitious deafness are cerebral meningitis and scarlet fever,” and, as Pintner adds: “Both these diseases are known to affect in many cases the mentality of the normal hearing child.” (p. 420) One longs for more research evidence on this point.

As for the congenitally deaf, Pintner (156) ventures the suggestion that such deafness occurs more frequently among people of lower mental ability. He refers to a study of family heredity carried out in collaboration with Osborn (157) in which a “large percentage of poor intelligence was revealed” among the members of the families of the deaf to whom intelligence tests had been given.

## (15) Diseases of the Central Nervous System

## Spinal Meningitis and Feeble-mindedness

Goddard (77) describes spinal meningitis as being "characterized by inflammation of the membrane surrounding the brain and spinal cord, which inflammation and disturbance may easily be conveyed to the tissues of the nerve centers themselves, and so might be expected to cause trouble." (p. 599)

Goddard points out that the deleterious mental effect from this disease is immediately noted, and that its connection with the disease is therefore convincing. Goddard states that the newer treatment for spinal meningitis has reduced the mortality to twenty-five per cent as against seventy-five per cent formerly. Statistics are apparently not available as to the actual incidence of feeble-mindedness following spinal meningitis.

## Epidemic Encephalitis \*

Hallowell (82) reports on twenty-four children who appeared in a Philadelphia clinic, all with a history of acute epidemic encephalitis, or "sleeping sickness." Certain intelligence records were available on the Stanford-Binet and on some form-board tests, but these had all been administered from three months to six years *following* the attack of sleeping sickness. However, Hallowell attempted to get an estimate of the pre-disease mental ability of these victims by securing reports and opinions from parents and teachers. All children were rated by this method as having been previously normal.

Hallowell found that seventy-one per cent of her cases manifested some kind of mental abnormality, either feeble-mindedness, hyperkinesis, or abnormal slowness. Three definitely feeble-minded children had been attacked by the disease in the first or second year of life, "when apparently the central nervous system is too sensitive to hold up against the inroads of the encephalitic germ."

It would appear, therefore, that, in some cases, encephalitis lethargica affects I.Q. The degree of seriousness is probably in proportion to the age of onslaught. It may be also that mental development is "arrested," at the age of attack. It must also be recognized, however, that many cases of this complaint are known to retain their normal intelligence following recovery. Again, it must be commented that the rather low average mental level rep-

\* As we go to press, a serious epidemic is reported in St. Louis, Mo. We hope the local psychologists, as well as pathologists, will "do their part," in furthering research on this serious malady.



resented in Hallowell's group is not markedly different from the average of all children who attend public clinics, and this level may represent social selection as well as disease retardation.

An interesting further procedure would be to compare the average of these children with the average of their siblings, due allowance being made for the tendency of sibling regression towards the mean.

Another study on the relation between history of encephalitis and test intelligence is reported by Lange (110) who studied thirty-nine cases (twenty-five boys, fourteen girls) in the clinic of a State Reformatory at Chemnitz-Altendorf, Germany. For these children the greatest mental retardation, as measured by Stanford-Binet, was found where the disease had attacked the child before the age of five years. On the whole, also, all the children studied showed evidence of retardation. Lange noted that the greater the time elapsed since the disease, the smaller the obtained I.Q. at time of examination.

Dawson and Conn (35) studied the effects of encephalitis lethargica on the intelligence of children, by comparing mental ratios of forty-five post-encephalitics tested by Burt's revision of the Binet, with mental ratios of other patients. Average comparative I.Q.'s were 84.6 for the encephalitics and 90.5 for 974 other hospital children who had not had the disease. For cases of short duration following attack (within twelve months) the average I.Q. was 89.5; for cases of long duration following attack (more than twelve months) the average I.Q. was 79.8, showing a drop of ten points, adequate statistical evidence to establish mental deterioration. Arrested development took place at varying ages depending on the age of attack of the disease. The mean I.Q. of twenty-three siblings of the encephalitics was 96, ten points higher than the afflicted. Twenty of these twenty-three patients, on re-test later, had a mean I.Q. of 76.4—again an adequate statistical difference in comparison with the sibling mean of 96, even allowing for regression toward the mean. Test-retest differences on thirty cases showed a drop from 87.7 to 76.1 on second test, a highly significant difference—again attesting to arrest of mental development.

Querido (163) analyzed the problem from a different point of view and decided that even though mental defect may follow in the wake of encephalitis, its significance as an etiological factor in producing deficiency is relatively unimportant. He compared the incidence of post-encephalitis among 218 mental defectives with its incidence among 100 normal children in the pediatric clinic. For

the mentally defective group the average was twenty-eight per cent; for the normally mental, it was seventeen per cent, revealing a difference which is statistically insignificant. He concludes that normal and mentally defective children have had encephalitis to about the same degree.

Another attack on his data showed that among his 218 cases of encephalitic defectives, 134, or sixty-one per cent, had records of abnormal mentalities in their heredity; of 496 mental defectives, with no history of encephalitis, 330, or sixty-six per cent, also showed hereditary factors, making for mental deficiency. The two proportions are approximately the same. His conclusion is that encephalitis is a relatively unimportant factor in contributing toward mental deficiency as compared with other factors in its train.

Almost every one familiar with the post-encephalitic is ready to testify to the damaging effects on personality, wrought by the disease. It is this marked disturbance indeed which is much more likely to precipitate the child into the clinic than general mental retardation as such. The behavior manifestations, however, which afflict so large a percentage of victims cannot be discussed in this chapter.

### General Paresis and Mental Deterioration

It is well recognized in every clinic, laboratory, or hospital, where evidence is at hand, that victims of general paresis undergo mental deterioration with the progress of the disease.

General paresis and cerebral syphilis (like senile dementia, arteriosclerosis, Korsakow's psychosis, alcoholic dementia, and other toxic psychoses associated with apoplexy and myxoedema are characterized by a loss of memory, total or partial, of the more immediate past, especially that past since the onset of the brain disease, and often of the whole past life of the victim. No estimate of the degree to which such loss of mental functioning is correlated with extent of the toxic condition will be drawn up, but for a method of determining or measuring the amount of mental deterioration, after such deterioration has set in, the reader is referred to Babcock's work. (8) It is to be hoped, now that a scale has been developed, that research will follow having for its purpose the investigation of *degree* of impairment following brain lesion. Babcock is continuing her studies in this direction. The method can also be adapted to a measurement of deterioration in other degenerative diseases, such as schizophrenia.

## (16) Intra-uterine Conditions

Although this chapter is given over almost entirely to a consideration of environmental factors which may affect the development of intelligence, it would not be amiss to include a brief reference to the influence of special intra-uterine (environmental) or "congenital" conditions prevailing before birth. Hereditary traits are due to differentiation within the germ cell, and, as such, do not concern us here. But if the germ cell itself is injured, either before or after fertilization, the effect may be considered as due to a special environmental condition outside of the developing organism but within the parent's body. The most common kind of "pre-natal influence" of this sort, however, is that which is operative within the body of the mother after fertilization has taken place. The child may exhibit the effect at birth, or, possessing the structural changes at birth, may reveal the abnormalities in function at a later stage of development. (203)

Some of the special congenital conditions which are popularly considered to leave deficient intelligence in their wake are: (1) Extreme malnutrition of the mother during gestation, which results in depriving the embryo of needed elements from the maternal blood stream. (2) Severe, prolonged or wasting diseases, such as tuberculosis, cancer, diabetes and pellagra, may set up similar handicaps. (3) Infections, especially syphilis, which attacks the central nervous system. The results are not always immediate. (4) Toxic conditions, bacterial or alcoholic in origin, may affect the growing embryo; may even indeed affect the sperm cell before conception and result in defective offspring. The evidence, especially on paternal alcoholism, needs much more research. (5) Under- or over-activity of ductless glands during pregnancy may affect the mental equipment of the offspring. The best known instance of this sort is to be found in the case of cretins, who, born without adequate thyroid equipment, are physically and mentally stunted. The condition sometimes responds favorably to early administration of thyroid secretion after birth. (6) Birth injuries, especially mechanical injury resulting from prolonged or difficult labor as a result of severe pressure on the child's head, may arrest neural growth. (7) Psychic shocks or severe emotional experiences or strain of the mother, resulting in ductless glandular changes, the secretions of which are carried to the child through the maternal blood stream; or which, producing uterine contractions, may alter the blood supply to the foetus, and may affect the mentality of



the developing offspring. The evidence here is largely theoretical and worthy of much more intensive investigation. Medical and clinical cases should offer suggestive material for research.

The above seven categories of pre-natal environmental influences have been given, because in a few cases, they are known to have resulted in mentally deficient children. But when one considers that about two out of every 100 children are deficient, and that by far the largest single cause for mental deficiency is to be accounted for by the germ plasm itself, the proportionate contribution of intra-uterine factors toward feeble-mindedness is relatively small. Medical science, on the other hand, is fast approaching a stage where these vitiating conditions can be largely controlled and therapy instituted either through prevention or early pre-natal treatment.

#### SUMMARY ON PHYSICAL FACTORS

It would appear, on the basis of evidence submitted in our discussion, and referred to elsewhere, that the public has been under a serious misconception in regard to the mental after-effects of physical development, physical condition, diseases, accidents, and other such handicaps, with the exception of lesions, toxic infections, and other injuries to the central nervous system. As measured by our present available mental tests, no serious mental changes have been found to follow somatic change outside of the central nervous system. True, not all possible disease and accident conditions have been reported or investigated, although intensive work is being directed toward this end. Dawson and Conn (36) have recently reported results of testing a large number of hospital children in Glasgow, covering many diseases. They have checked mental development by comparisons in many cases, with sibling scores. They find no evidence of intellectual impairment with chronic illness in general: specifically, too, chorea and the Parkinsonian syndrome seem to produce no bad effects on intelligence, nor do spinal diseases; even localized cerebral disease is not necessarily affective. Spastic diplegia and encephalitis lethargica are sometimes followed by dullness; sometimes not. Epileptic patients are usually of low intelligence. Acute illness is marked by slight improvement in mental efficiency.

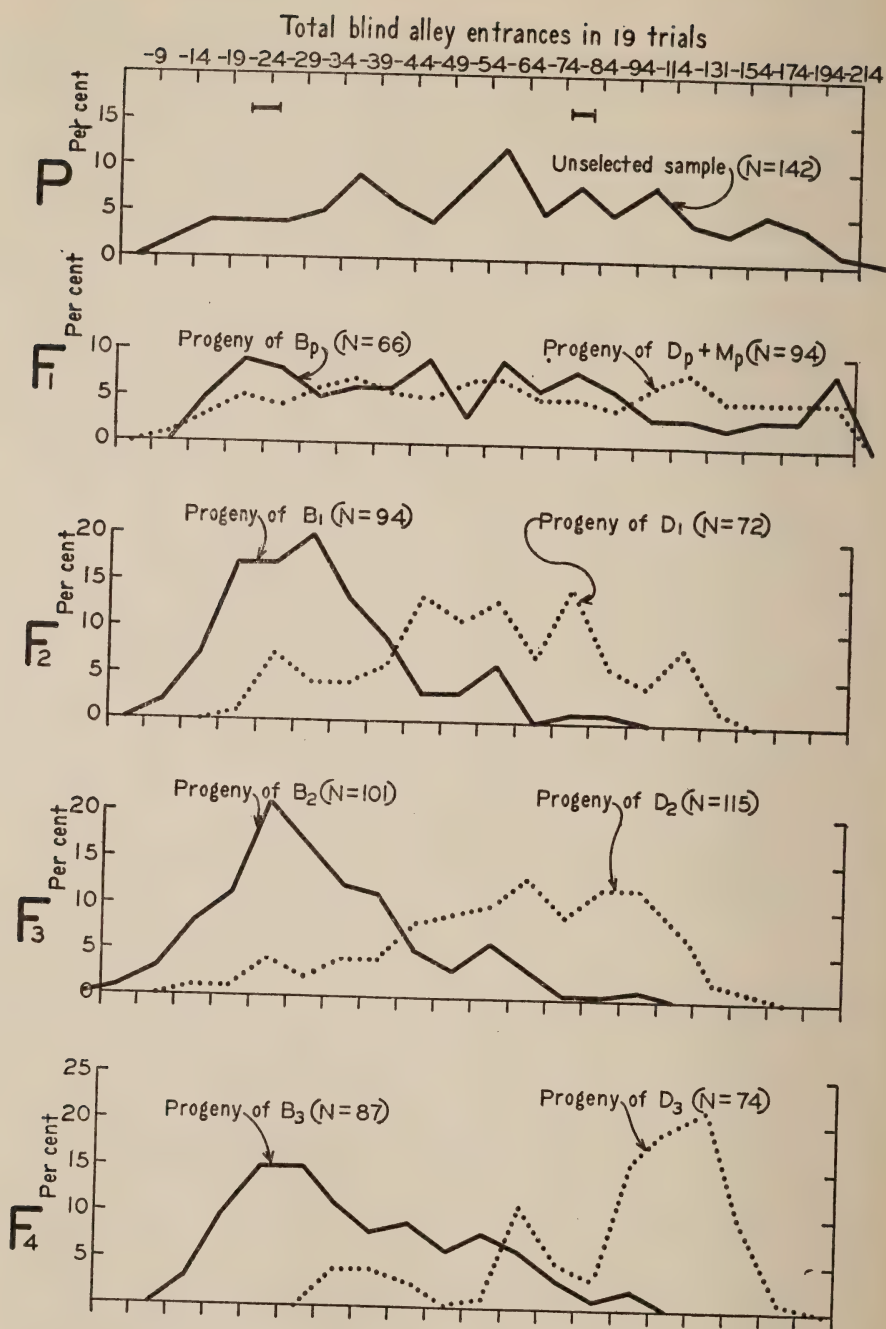
Results of studies reviewed in our chapter are uniformly negative in the case of such widely prevailing maladies as malnutrition, diseased tonsils and adenoids, intestinal toxemia, simple glandular deficiencies, hookworm and serious physical hurt. Nor is there any

basis for the popular notions that one sex is brighter than the other, that relative intelligence increases with age, that there is an "adolescent spurt," or that mental maturity and physical maturity are closely inter-related. In the case of mental and physical developmental correspondence, however, the hypothesis which holds that superior minds have superior bodies, and that inferior minds have inferior bodies, seems to merit further study. Effective work in this field is at present being done by Shirley. (179, 179-a)

#### D. ANIMAL EXPERIMENTATION

Our chapter up to this point has concerned itself almost exclusively with studies on factors affecting the development of intelligence in human beings. Of almost equal significance is the work of the animal psychologist who studies mental inheritance in animals, particularly in the rat. In our section on parent-child mental resemblance, we pointed out that the mere fact of correlation did not prove that heredity was the cause of such resemblance, for relatives tend, by and large, to live in the same kind of environment. It might just as logically be claimed that such resemblances were due to similarities of environment. The animal psychologist is able to circumvent this difficulty by his ability rigorously to control the environment, and to vary only the heredity, and his experiments are therefore of particular interest. Some work of this sort has been done, and literature is becoming available which limitations of space and time prevent our reviewing here. A single example will be sufficient to show the type of work which can be done under experimentally controlled conditions. For other leads, the reader is referred to (125).

Tryon (204), working in California, recently reported a study of maze learning ability in rats. (204-a) It has been customary to use the rat's ability to run through a maze as a measure of his learning ability or "general intelligence." Perhaps this maze-running ability is not a measure of general intelligence, but at any rate it does serve to show individual differences in learning. Since the rats can be reared in a strictly uniform environment—a condition impossible in any human experiment—the extent to which two races of rats can be bred, selected on the basis of this learning ability, is an indication of the strength of heredity to account for the ability. The accompanying charts show pictorially the success with which Tryon has selectively bred seven generations of rats, and the definiteness with which brightness and dullness have been established from the standpoint of heredity alone.





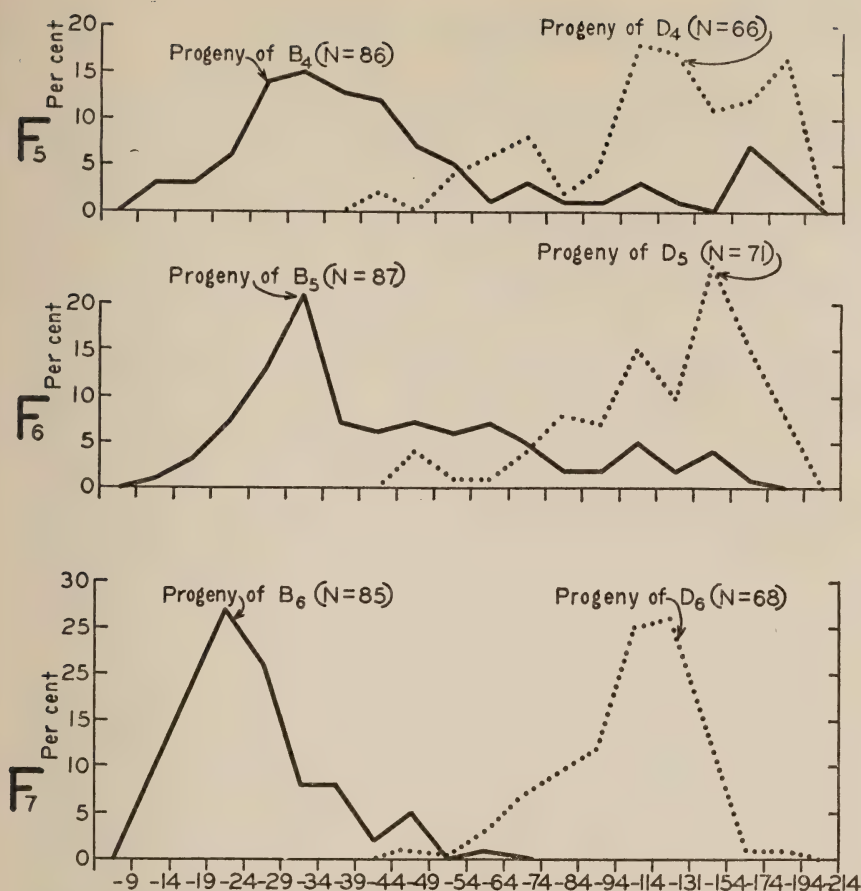


FIG. 30. EFFECTS OF SELECTIVE BREEDING ON MAZE LEARNING.

*From Tryon.*

"In the accompanying figure along the top is the scale of brightness as evidenced by the total number of blind alley entrances made in 19 trials. All the distributions below use this common top scale. For instance, a bright animal who made from 10 to 14 errors would fall under —14 of this scale, a dull who made from 195 to 214 would fall under —214, etc. The first generation of rats marked "P" to the left is shown just below the scale. The total number of P rats was 142 and the per cent of them lying at each point on the scale is indicated in the distribution. The brightest of these were bred together, and then the duller, giving the two F<sub>1</sub> groups, as indicated. This selective breeding has been continued down to the F<sub>7</sub> where the 'progeny of B<sub>6</sub> (bright F<sub>6</sub>)' are markedly different from the 'progeny of D<sub>6</sub> (dull F<sub>6</sub>).'" (204-a)

## III. GENERAL SUMMARY

The nature-nurture problem was first made scientifically articulate by Galton, who showed that high ability tended to cluster in certain families. His work was followed a generation later by a series of studies which stressed the presence or absence of hereditary or of environmental effect in determining traits. Correlations of resemblance between twins, sibs, and socially related groups, confirm the presence or absence of a common trait or characteristic level of performance among similarly situated individuals.

More recently emphasis has been placed on the quantitative aspect of this effect, *i.e.*, how much a stated environmental factor, or given heredity, can be expected to contribute to the development of a trait. Here are to be included the experimental studies of orphanage children, foster children, twins reared apart, and research on animals. Future work will revolve around the mechanics of transmission of heritable traits. Very little has yet been done in this field. The present materials bearing on heredity and environment consist largely of studies of the second and third type, and these have been reviewed in this volume.

The approach in this chapter has been that of presenting a summary of selected studies, selected for their thoroughness and precision of scientific method, or for their historical significance.

In general, the most valid research has been found to conform to three main procedures: (1) With heredity kept constant, individual differences have been studied with variation in environment. (2) Environment has been held constant, and individuals have been studied from the standpoint of a varying heredity. (3) Groups of known intelligence have been subjected to a change in environment, and the influence of such change (if any) on intelligence noted.

Resemblances found among various genetically (or socially) related groups living together were compared with resemblances found among individuals of the same genetic (or social) categories, who had been living under different environments. These data included a report on mental resemblances as found among identical twins, siblings, parents and children, and groups of individuals, related, not by blood, but by socio-economic determiners.

Resemblances were studied among unrelated children who had been brought together in a common environment, such as obtains in an orphanage or in a foster home.

The effect of change in environment was studied for groups of known intelligence; the mental change, if any, was contrasted with

matched groups originally equated by test, who continued to live in their natural environments.

Specific environmental factors which have been investigated include such cultural influences as: Change in social status of the home; bi-lingualism in the home; urban-rural residence; attendance at school and nursery school, and the like. A small block of findings was submitted on the relation of some of the above factors to separate mental processes and sub-test items—such as verbal ability, as distinct from the composite “general intelligence” as measured by test.

The influence of physical factors on the I.Q. was investigated. Such factors included: Age, sex, physical growth; physical defect and psychopathic conditions; pubescence; malnutrition; glandular deficiencies; diseased tonsils and adenoids; intestinal toxemia; hookworm; orthopedic handicap; syphilis; allergy; deafness; and diseases which invade the central nervous system, such as epidemic encephalitis, general paresis, and so on.

#### IV. CONCLUSIONS

Of the two sets of influences which have been examined for effect on test intelligence, namely, social-cultural and physical factors, the evidence weighs more in the direction of the former and less in the direction of the latter, than uninformed preconceptions would have led us to believe.

Of the beneficent culture influences listed on the previous page, evidence has accrued to indicate the positive importance of good cultural environment of the home, urban residence and some inconclusive evidence in favor of nursery school attendance. Retarding influences were found associated with bilingualism in the home, and rural residence. But whether in the direction of heightening or of lowering the I.Q. certain conditions must be met before the above influences can become effective. These conditions are: (1) That the difference in cultural backgrounds of the home must be extreme (as compared with the “average” American home); (2) that cultural change, if any, be introduced at a very early age; and (3) that change to the new environment, whether home or resident nursery school or geographic residence, be maintained over a long time in the developmental period.

Actual estimates, in terms of I.Q. points, on the effect of pronounced change in home background have been issued by Burks



(125), Freeman (125), and Jones (98), and while they cannot be taken as final, they furnish an interesting indication of the opinion of present-day psychologists.

These estimates agree, in general, on a change of about seven I.Q. points on the average for a group of children reared in a social level distinctly higher than that into which they were born. For an exceedingly great shift in level (which might occur once in a thousand times) Burks estimated an I.Q. change from nine to twenty-seven points. Holzinger (87) also tries to ascribe proportional contributions to nature and nurture in the development of general test intelligence, and estimates these to be about fifty-fifty on the average.

However, the trend of recent investigations is to ascribe less significance to average differences to be found between two groups than to *variation* or *range* of individual differences *within* groups. Burks, by a method which has been criticized as not warranting general confidence, calculates that home environment accounts for about seventeen per cent of the variance in I.Q. This she contrasts with thirty-three per cent contributed by parental intelligence, and seventy-five per cent by "total heredity." Holzinger considers the respective forces of nature and nurture in producing variation or range of individual differences as at two for nature to one for nurture.

In regard to the potency of physical interference in altering the I.Q., the evidence, where interlocking variables have been allowed for, has been generally negative. In almost no case of handicap due to abnormalities caused by growth, ill health, accident, or disease, is there a corresponding retardation of intelligence except in the case of deafness (which retards acquisition of language) and diseases of the central nervous system in which lesions, toxic conditions, and nerve tissue destruction have been able to slow up the development of intelligence. Again, generally speaking, the degree of effect is in proportion to the earliness of onset of attack, victims under four or five years suffering the greatest handicap. Mental development is sometimes "arrested" at year of attack. It must be pointed out, however, that diseases of this type (*e.g.*, epidemic encephalitis) are not always followed by mental retardation, since many of their victims escape unscathed intellectually.

The general trend of the research evidence on the influence of environment gives to environment less weight than might have been expected. In more than one study it has been pointed out that some of the data attesting to change have been based on unsound deduc-

tions, weaknesses in selection of cases, weakness in measuring instruments, unguarded deductions from insecure data. If actual innate intelligence could be tested by instruments, not so heavily charged with environmental content, as those which are offered by psychologists today, the relative ineffectiveness of environment to limit or inflate I.Q.'s would be less rather than more than that shown in the studies presented.\*

But until, and if ever, we have measurements of intelligence based on physiological rather than environmental material, we are compelled to accept the findings of today as the best evidence on hand on the influence of non-hereditary factors. Our wonder is that the differences attributed to environment, under these conditions, is so small.

Of special interest for the immediate future is a research attitude advanced in the most recent nature-nurture publications, namely, that investigation be focused on *specific test reactions* rather than on general test intelligence; since environmental handicap or advantage is reflected in specific test items much more distinctly and definitely than in the general composite of test intelligence, represented by I.Q.'s, M.A.'s or total raw scores. Preferably these specific tests should be of specific mental processes, unique in the psychological sense, as set down by Kelley, Spearman, and others. But until these independent mental entities or traits are isolated by psychological statisticians, nature-nurture investigators might well direct their studies to the growth and development of empirically recognized separate mental processes, such as verbal ability, number sense, sense of geometrical or spatial relationships, and the like.

And we cannot close our chapter without again reminding the reader of the caution, voiced on page 275 f, that all the studies reported in regard to the relative influence of heredity and environment, refer to these two factors as they operate here and now in our populations. Any drastic change in the distribution of cultural environments, or any curtailment or expansion of the range of innate mental ability bequeathed to oncoming generations, will, of

\* At this point we are tempted to remind the reader of Spearman's "g" or general factor, entering into any mental performance, and which without knowing its essential nature, may be psychologically considered as "mental energy." Spearman appears hopeful that physiology may some day discover a corresponding material energy, and refers to the statements of Head and Myers who stand ready to identify "central nervous energy" with "mental energy." But proof is yet lacking. Spearman himself concedes that "physiologically 'g' may be due to the general plasticity of the nervous system, the quantitative and qualitative alterations of the common blood supply, the state of the endocrine glands, or many other physiological conditions." (196, p. 67) Obviously here is a future field of research of intense interest to the eugenicist.

necessity, alter the relative contributions of either factor in accounting for individual differences in the intelligence of the American people.

### RECOMMENDED READING

It is difficult to make a selection of references for the reader, since the material is to be found in so many scattered sources which are listed in the bibliography at the end of this chapter. Chief interest will center in the immediate future on individual reports of identical twins reared apart, experimental research projects using identical twins as Subjects and Controls, and on follow-up studies of children adopted into foster homes.

The largest single collection of material is to be found in the *Twenty-seventh Year Book of the National Society for the Study of Education*, to which this chapter is greatly indebted. Highly significant is Lawrence's study on "*An Investigation of the Relation between Intelligence and Inheritance.*"

The reader, especially interested in the relation between physical factors and intelligence, will find an excellent summary in Paterson's "*Physique and Intellect.*" And, of course, no student of eugenics would omit detailed reading of the separate case reports of Müller and Newman on identical twins reared apart, published at intervals since 1925, in the *Journal of Heredity*.

### NATURE-NURTURE INVESTIGATIONS IN PROCESS

Stanford University, California (Prof. Terman)

Twins (Carter)

University of California, Institute of Child Welfare Research

Twins and pre-school children (H. E. Jones) (B. S. Burks)

Animal mental inheritance (Tryon)

University of Chicago

Twins, Foster Children (Freeman, Holzinger, Newman)

University of Minnesota, Institute of Child Welfare in coöperation with the Children's Bureau of the State Board of Control

Foster children (Leahy)

University of London (School of Economics) Dept. of Sociology and Social Biology, supported by British Broadcasting Corporation

Twins, reared apart

London County Council Schools (Prof. L. Hogben)

Twins

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CHAPTER V

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## I. INTRODUCTION

In our chapter on the Measurement of Personality, the lack of adequate measuring instruments was pointed out. Since accurate measurements are the *sine qua non* of all scientific observations, it follows that our scientific knowledge of the structure and basis of personality is also inadequate. We have as yet not been able to make an accurate and systematic record of what people do, how they behave, or can be expected to behave or react to certain situational conditions. Hence our knowledge of factors at work influencing behavior reactions—expression of personality—is still vague, unorganized, and largely impressionistic. We have made only a beginning in the production of study methods and measurements of personality; we have made even less progress in accumulating a scientific body of fact to account for these reactions and manifestations.

Again it was pointed out that a decidedly complicating element in the measurement of personality (which does not operate in the measurement of intelligence) is the Subject's ability to cloud the picture by giving verbal reactions not in agreement with truth or fact. It may be then that the points of view which we at times think we have established on personality make-up (habits, attitudes, prejudices, systems of behavior on a basis of verbal reactions) are farther from the truth than none at all. There is at least the possibility of distortion which must be faced.

Hence, when we try to assemble the evidence which seems to be at hand on the "make-up" and influences back of personality, we are faced not only with a lack of accurate data, but also with much, which may, in a greater or less degree, be inaccurate.

The above discussion presupposes an analytic approach to the study of personality, *i.e.*, taking the personality as it is in any stage of development and trying to unravel its nature; with perhaps a corresponding attempt at theorizing on its molding forces. This is essentially the method of the "armchair psychologist," the psychoanalyst, the psychiatrist—and their deductions, however illuminating and suggestive, cannot be considered as exactly established fact.



A more thoroughgoing analytical approach is that of the experimental psychologist who would make a systematic study of personality under various conditions of health, disease, age, heredity, and social forces; who uses objective psychological and physiological tests; who tries, if unable to control, at least to allow for causative factors, and who will ultimately offer evidence of considerable importance. A large bulk of present psychological literature on personality consists of reports by these experimental workers, from the laboratory, the schools, the clinics, and other institutions of human activity.

There is, however, still another approach which we might call the synthetic; that is, taking a relatively undeveloped human organism and subjecting it to a variety of experiences, influences, training, *etc.*, to note the effect. This is essentially the method of the genetic psychologist, of the behaviorist, and of the "maturationist." Material from preschool and nursery school centers, from intensive observation of infants in their homes, is rapidly accumulating.

Here again we begin to see a splitting in the avenue of approach; the maturationist is interested in watching the growth of structure and functioning, noting, as Gesell, Shirley, and others have done, at what ages certain behavior reactions first appear, on the average, even without training; and within what age limits these same reactions cannot be made to appear at all, or to appear very poorly developed, even under a high degree of training.

The behaviorist resembles the maturationist in one respect: Both stress the observation of actual behavior reactions and the deduction of principles from such controlled observations. In emphasis, however, the behaviorist leans much more heavily on what external stimuli can be found to do in bringing about a change in the individual. Many people have accepted Watson's claim that an individual is made before the age of five years; *i.e.*, by controlling the environmental forces at work on the child, his emotional and intellectual make-up may be shaped. Watson practically rejects instincts and hereditary mental traits. Admitting that he goes beyond his facts, he maintains, that, given healthy infants and his own specifically chosen environment, he can produce any kind of adult specified,—doctor, lawyer, beggar-man, thief, and so on,—regardless of ancestral traits and individual talents and tendencies. (p. 104) The maturationist, on the other hand, sees behavior reactions principally as expressions of a growing neural and muscular structure, and human variability as due to hereditary patterns. Details

of these two schools of thought, behaviorism and maturationism, will be discussed later. (pp. 387 ff and 384 ff)

Not far removed from the maturationist is the endocrinologist who is concerned with the relation between personality manifestation and ductless glandular constitution. The individual with an over-active thyroid is "nervous," excitable, emotional, and so on, while his glandular opposite, the hypothyroid, is slow, heavy, and, at times, stolid.

While it is recognized of course that endocrine disturbances can arise at almost any stage of development, it is interesting to note that for these cases, whose malfunctioning occurred before, or during, adolescence (*i.e.*, before physical growth has ceased) there is a rather close correspondence between endocrine disorders and body type. This parallel brings in its train a school of "constitutional types" of personality, headed by Kretschmer in Germany.

We are again forced to a dual point of view in regard to personality, of which there are many gradations and individual differences—namely, that one's overt behavior is partly the result of constitutional factors, and partly is socially determined (by diversity of environmental influences, educational, parental, *etc.*). How to separate the two influences, or to estimate the significance of the native factor becomes a problem almost incapable of solution in even a relatively undeveloped individual of pronounced type. How much more so, for the mature individual of no especial body type! Here, too, Personality is doubtless a matter of 'limits set by heredity.'

Influence of circumstance may be highly significant or trivial, depending upon the kind of person on whom it is reacting. Some dominant environmental stimuli, strong enough to precipitate a neurosis in one person, are ineffective on another; or, in other words, the reaction in its expression is determined by hereditary hardihood as well as by social impact. As Thomas (135) has said, "In given critical situations one person may readjust on a higher level of efficiency, another may commit a crime, and another may go to a hospital for the insane." (p. 9)

Or, again, we may consider personality as composed of (1) genetic constitution which determines ways of reacting, such as speed and flexibility of reacting (temperamental manifestations); and (2) reactivity to social influence, which results in a "finished personality" who behaves, overtly at least, according as he has been socially conditioned.

Obviously, it may be repeated, impartial psychologists are not

yet ready to give a definite evaluation of the soundness of the work of the different schools of personality study. Years of research are needed before conclusions can be established; but the interest is strong; the movement is launched; tentative findings are highly suggestive; and progress is imminent.

Here it is our purpose to sum up the present stand; to present the viewpoints held by leaders or schools in the field of personality study. We shall refrain as much as possible from participating in the discussion, either through criticism or comment, and limit ourselves to an impartial and objective view.

## II. PERSONALITY: A COMMON MEETING GROUND FOR SEVERAL SCIENCES

It may be of interest to mention here that two colloquii (135, 136) of experts have already been held "to survey the field of the interrelations of psychiatry and the social sciences," with a view to greater coöperation among those concerned in studying the nature and influences of cultural environments. The approach in these colloquii was that, regardless of the significance of constitutional and hereditary factors in determining personality and behavior reactions, it is the *situations* of life, experiences, *etc.*, which are factors of great and usually of determining weight. All sciences dealing with man—biology, anthropology, psychology, education and social science—are especially concerned at present with behavior problems, and with evolving predictions which will lead to the control of behavior. (p. 4)

It follows naturally that the interpretation of personality is closely linked with the particular science which studies it. May (113) sums up the various approaches to an understanding of the foundations of personality, as follows:

"A group of psychologists, psychiatrists, neurologists and physiologists, who by training and temperament have become interested in inner mechanisms, and their biological antecedents, believe that the foundation stones are in the shape of reflexes, habit patterns, muscle tensions, tissue wants, metabolism, or else in the shape of instincts, impulses, urges, drives, complexes, motives, and the like. Another group of psychologists, psychiatrists, sociologists, and cultural anthropologists, who by their training and temperament have become interested in the social environment and its cultural antecedents, find the foundations of personality in group codes, social standards, family adjustments, living conditions, economic standards, or else in culture



patterns, such as customs, mores, types of language, beliefs, superstitions and other manifestations of social traditions." (p. 99) \*

May points out that the biological sciences will help us to understand the expression of biological needs, common to all mankind (eating, sleeping, *etc.*); while the social sciences will enable us to interpret racial differences in cultural patterns. But to study *individual* differences within any one group—each individual's peculiar behavior pattern, attitudes, ideas, and opinions—requires all the resources of all the sciences together.

### III. VIEWPOINTS ON PERSONALITY FROM VARIOUS PROFESSIONAL AND SCIENTIFIC BACKGROUNDS

#### A. INTERPRETATIONS WHICH STRESS PHYSICAL AND PHYSIOLOGICAL BASES

Herbert Spencer's definition of life as "a continuous adjustment of internal relations to external relations," reflects the inconceivability of growth of any organism without its attending environmental medium. The mere fact of existence always involves two factors,—internal constitution and external conditions calling forth reactions from the organism considered. Child (31) points out that this line of thinking applies with equal certainty to inanimate objects. He writes:

"The stone and the feather behave very differently in response to gravity in air, and we say that the stone falls rapidly, the feather slowly because the stone is heavy, the feather light. But in a vacuum, both stone and feather fall at the same speed. In both cases then, the behavior of the stone and the feather is not simply a matter of internal conditions, that is, of their constitution or weight, but of external conditions as well, namely, the medium in which their reaction to gravity takes place." (p. 128)

Animal, especially human, behavior is as directly dependent on internal as on external conditions. The "pure" physiologist, according to Child (31), takes the position that the general structural and functional conditions of the human being are physiologically set at birth; and are subject to but slight alteration afterwards. Prenatally, in the early stages of embryonic development, physiological interference, and consequent physiological change are possible. Postnatally, especially in the early years, social interference

\* From May, M. A. Foundations of personality. In *Psychology at work* edited by P. S. Achilles. McGraw Hill, 1932.

and consequent modification of psychological reactions are possible. In so far as temperament has a physiological (chemical) base, it is largely innate. In so far as its expression is social, it is largely acquired. Hereditary constitution may always limit the extent to which modification can be established, but on the other hand, it is rarely, if ever, that the full potentialities of any individual are tried to the straining point.

Some interesting experimental work in the physiological dynamics of behavior has been done under Lashley (99), who summarizes in his introduction the various outlooks:

"... influential groups have minimized . . . environmental factors and have ascribed unlike temperaments to different hereditary endowments. The more conservative have asserted the existence of constitutional differences, but assumed their ready modification under social pressures, the more radical have regarded the constitutional differences as inalterable and expressed a pessimistic attitude toward all efforts at social control.

"Not less in dispute than the origin of temperamental differences is their significance as dynamic forces in behavior. One group of extremists, including many students of psychopathology, has ascribed all human motivation to emotional pressure, making emotion the most potent force in behavior. Others at the opposite extreme, deny any functional value to emotion, regarding it only as an explosive discharge of energy occurring when the individual is unable to make an adaptive response. For some, human motives are products of mental energy; for others, tensions in the muscles of the viscera." (p. viii) \*

Lashley emphasizes the need for critical research on *motivation*, and classifies the problems as four-fold: (1) Origin of temperamental differences; (2) their nature as biological phenomena; (3) their stability in comparison with other types of behavior; (4) their significance for social adaptation. His publication introduces the experimental approach with rats and with human subjects. Since these studies in Lashley's own words are "adventures in methodology" rather than final pronouncements as to results, they will not be reported here.

### *i. The Physiology of Emotions*

However, it is obvious that the riddle of personality is very closely tied up with the energizing power of motivation. Much of our motivation is on a sub-cortical level; much of it indeed is on an emotional level. We often behave as we do because our instincts and emotions rather than our ideas direct our reactions. Hence,

\* From Lashley, K. S. *et al. Studies in dynamics of behavior*. Chicago Univ. Press, 1932.

on account of bodily changes which are set up during emotional excitement, a distinct contribution toward the physiology of personality is to be found in the various theories which have been offered from time to time to explain the physiology of emotion. The most important of the earlier explanations is the James-Lange theory (97). James, in 1884, and Lange, in 1885, independently published their theory that the recognition of emotion is the awareness, through feelings and sensations, of bodily changes which occur during the emotion. "If the tensions, throbs, flushes, pangs, suffocations, were removed, no emotion would be felt," said James. An object is apprehended by a sense organ, afferent impulses pass to the cortex, and the object is perceived; perception sends impulses to the visceral organs, and from the complexities thus set up, afferent impulses are returned to the cortex and felt as emotion. This "back flow" arises also from other peripheral muscles and organs. Lange attributes our feelings of joy and sorrow to stimulation of the vaso-motor center, a narrower conception than James'. (97)

The visceral and other bodily changes which accompany the feeling of pain, fear, rage and hunger have been intensively investigated by Cannon. (29) Many of these changes can be outwardly observed and objectively recorded, such as pallor, blushing, excessive perspiration ("cold sweat"), dry lips, tongue and palate ("tongue cleaves to roof of mouth"), with stoppage of saliva, dilation of pupils, erection of hair ("hair stands on end"), quickened heartbeat, quickened breathing, twitching and trembling of mouth and nostrils, dilation of bronchioles, quickened blood coagulation, discharge by spleen of extra red corpuscles into the blood stream, mobilization of sugar in the circulation, *etc.* During these changes the adrenal glands have been secreting vigorously into the blood stream, fatigue is abolished, digestive processes are temporarily inhibited—the secretions of saliva, gastric juice, pancreas and bile, being stopped, and peristaltic motions of stomach and intestines ceasing. In times of emotional strain and stress, the sympathetic division of the autonomic nervous system has an inhibitory power over cranial-sacral nerves.

All these changes, Cannon has shown, are very definitely directed toward salvage of the organism. The heart contractions increase in vigor, breath is taken in faster, muscular activity is heightened as fatigue disappears, all preparatory to fight or flight. (Temporarily digestive and sex activities are held in abeyance until the danger or emergency is over.) The pupils dilate to let more light into the retina, the blood coagulates quickly to help



healing in case of wound, sugar is mobilized to create energy for the struggle.

Clearly, here, evolutionary theories of development contribute largely to an explanation of these physiological responses in modern man, especially when in a state of emotion, mood, or characteristic instinctive act. As a hunter in the forest, or a warrior struggling with his foe, primitive man had to be physically prepared to meet the strain. Modern man, however, is no longer called upon to fight bodily or to run away from his tormentor, yet these inner changes are just as immediately initiated within him; nature has not yet caught up with civilization. The above effects are not under voluntary control, especially those connected with the smooth musculature. Hence when modern man is frightened or annoyed, he still feels a "sinking in the pit of his stomach," "cold chills down his back," a "dry mouth"; he may even reveal trembling, "cold sweat," a flushed countenance, or a flashing eye, but when it comes to utilizing these bodily changes, he is regulated by circumstance. In most cases he can resort neither to fight nor flight; the outward manifestations are curtailed but the emotions accompanying them are felt.

Since the cortex has no direct control over the functions of the viscera, their behavior cannot be subdued or changed on cool demand. Telling a person not to worry or be afraid, will not change his blood pressure or reinstate peristalsis. (Indirectly, of course, conditioning him toward objects so as not to excite fear, anger or pain in the first place is the preventive and therapeutic measure of control.) But excitement once aroused demands expression in action, or time for its subsidence.

It is obvious that the human animal has undergone almost no changes, if any, in thousands of years, in his physiological make-up and functioning. Civilization and culture, on the other hand, change enormously from century to century. It is only recently that the physiologist has discovered what is going on within. How to adapt this organism, designed for a primitive life, to meet the demands of an almost wholly artificial life, becomes the problem of modern man under guidance of the psychologist.

### The Physiology of Specific Emotions

To account for the awareness of *specific* emotions, Cannon and his co-workers have offered a theory which displaces the earlier accepted James-Lange theory mentioned on page 361. James attributed the feeling of emotion to sensations from the viscera; Lange, to

sensations from the circulatory system. Both held that if these sensations were removed, no emotion would be felt. Cannon (29) reports that workers (directed both by Sherrington and himself) removed these return impulses surgically and found that emotions were as strong as ever in the experimental animals. Direct artificial stimulation of visceral organs by adrenal injections failed to bring any *specific* emotional mood. Cannon has established the fact that the neural counterpart of emotional expression is to be found in sub-cortical centers, in the optic thalamus. The process he outlines as follows:

"An external situation stimulates receptors and the consequent excitation starts impulses towards the cortex. Arrival of the impulses in the cortex is associated with conditioned processes which determine the direction of the response. Either because the response is initiated in a certain mode or figure and the cortical neurones therefore stimulate the thalamic processes, or because on their inward course the impulses from the receptors excite thalamic processes, they are roused and ready for discharge. . . . Within and near the thalamus the neurones concerned in an emotional expression lie close to the relay in the sensory path from periphery to cortex. We may assume that when these neurones discharge in a particular combination, they not only innervate muscles and viscera, but also excite afferent paths to the cortex by direct connection or by irradiation. The theory which naturally presents itself is that the *peculiar quality of the emotion is added to simple sensation when the thalamic processes are roused.*" (p. 368-9) \*

### Other Bodily Changes

Other physiological contributions to an understanding of personality are to be found in follow-up work attempting to study specific bodily changes in their relation to transient changes and moods of personality, or to relatively permanent types among psychopaths. Thus we find Scott (148) studying systolic blood pressure fluctuations in relation to sex, anger, and fear; Starr (154) studying motivational types as illustrated by respiratory graphs by methods employed in basal metabolism studies; Rich (141, 142) on body acidity and emotional excitability; Mann (111) reporting on blood sugar studies in mental disorders; Furukawa (47) offering an experimental study of the relation between blood groups and mental dispositions; Freeman (38) on deficiency of catalytic iron in the brain and schizophrenia; Lennox and Cobb (100) on the relation of certain physio-chemical processes to epileptiform seiz-

\* From Cannon, W. B. *Bodily changes in pain, hunger, fear and rage*. Appleton, 1929.

ures; Loevenhart, Lorenz, and others (107) initiating study of oxygen metabolism and catatonic stupors; Barcroft (15) on the respiratory function of the blood; Bancroft and Richter (14) on the colloid chemistry of insanity; to say nothing of the fever treatment of general paresis initiated by von Jauregg (165) and reported upon extensively by Kirby and Bunker (85). Newer developments in physiological chemistry, bio-psychology, especially endocrinology, may revolutionize our concepts of personality, of individual therapy, and of social eugenics.

## *ii. The Physical Bases of Personality Differences*

A more nearly psychological explanation of personality (but from the physiological point of view) leads us to a consideration of at least four different sets of scientific data,—namely, (1) the literature of “constitutional types,” including study of body build, structure, and physique; (2) the publications of the endocrinologists, or the study of body chemistry, and (3) the data on mental diseases and disturbances in personality which are based on organic unsoundness, such as lesions, accidents, trauma, toxic invasions, or other destruction of central nervous tissue mainly, the province of the psychiatrist; and (4) basically, of course, a recognition of those universal fundamental biological needs of life concerned with eating, sleeping, mating, begetting and rearing children, and seeking companionship, and the tensions created in trying to attain satisfaction. Here biology and psychology meet, indeed overlap, and cannot be considered independently of each other. This approach is stressed by the social psychologist.

Since the days of the ancients, human *types* have been popularly recognized, and linked with emotional make-up: The long-thin; the short-thick (who more recently have been displaced by the hyper- and hypo-thyroid) being grouped roughly into the emotional and the phlegmatic. Anthropology has differentiated individuals according to head shapes: Long-headed, or dolichocephalic; and short-headed (or round-headed) or brachycephalic (which is a matter of the relation of the length to the width of the head). Then, too, heads have shown a rough correspondence with certain body structures and it is on the basis of body structure that we shall first consider theories of personality.

### Morphological Structure

The leader of the constitutional type theory of personality is Kretschmer in Germany. Independently of work done elsewhere,



Kretschmer has evolved a very promising system of body types in relation to mental disposition. Already he has a large following, who, if they continue their studies with becoming conservatism, may do much to unravel this age-old problem of the dependence of mind on body.

Kretschmer lists three main extreme types of body structure: (1) The pyknic, (2) the leptosomatic, and (3) the athletic; into a fourth group he would place certain rarer, unimportant or modified types,—“the dysplastic forms which appear to be determined by the chemistry of the endocrine glands and are associated with unusual sexual and mental constitutions, with highly variant forms and with arrests of development.” (95, p. 52)

Returning to the three main types upon which Kretschmer founds his theories and bases his observations in scanning people, we find: (1) The pyknic, as of round, thick-set body, with soft, broad and well proportioned face. Men of this type tend to grow strong beards, and to become bald early. Kretschmer lists Goethe's mother and Keller, among others, as illustrative of the pyknic build. The pyknic type, when broken down mentally, tends to express itself in “circular insanities and neuroses”; and when not abnormal mentally, to alterations of mood between high and low spirits. In middle age, when inclined to be introspective, pyknics become melancholic, even as Goethe's mother was.

(2) The leptosomatic physique is described as under-developed with small proportions and sharp lean features, being often, indeed, quite childlike. It is the build of many great philosophers and dramatists; as examples, Kretschmer names Kant and Kleist. Mental breakdown for the leptosome tends to be of the schizophrenic order (*dementia praecox*). The most critical period of life for these people is in adolescence, when those of more delicate health are prone to enthusiasms, also to anxious philosophical meditations. They often have difficulties with their parents, are strained as to choice of vocation and general social adjustment. Often they show great bursts of activity, followed by compensatory relaxation, even neglect. Early schizophrenia may lead to permanent breakdown as in the case of Hölderlin.

(3) The athletic physique, as its name implies, is the typically bony, muscular body of the athletic. Psychologically and pathologically the “athletic” tends to parallel the leptosomatic, though to a less pronounced degree, including in its group not only many *dementia praecox* cases but a great many more epileptics.

(4) The dysplastic, which includes all abnormal physiques, is found rarely among the circular insanities but more among prae-coxes or epileptics.

The value of stressing traits as they appear among the abnormal and psychopathic is that this sort of study sharpens the observation as to which mental and emotional manifestations should be looked for in the normal. Kretschmer has summed up the expression of the various combinations of body type and mental make-up, in the following paragraph (95):

"Among sound normal people, the differences of bodily type express themselves above all in differences of temperament; that is to say, in differences of emotional constitution and mental sensitiveness. These are differences which, however, overlap considerably with what one usually regards as the native endowment in intelligence. Now, proceeding in the first place from the physical differences, we can distinguish six kinds of temperament, three of which are mainly connected with the pyknic physique, and three with the leptosomatic form. Once again, the athletic and dysplastic forms run, in the main, parallel to the leptosomes. The temperament which occurs predominantly with pyknics, we call cyclothymic, in consideration of their tendency to periodic oscillations of mood. That which occurs mainly with leptosomatic types, we call schizothymic, because of their great capacity for splitting up their conscious field into its elements. In both cases the tendencies show themselves as strongly in experiments with sound mentalities as in the symptoms of the corresponding pathological types.

"On the basis of actual research, it appears that ninety-five per cent of pyknics are of predominantly cyclothyme temperament, and that seventy per cent of leptosomes are schizothymes. The moods of the cyclothyme lie between the extremes of hilarity and sorrowful depression. Hence the cyclothymes can be divided into three further temperaments, according to the section of this scale about which the mood hovers. These three temperaments we call the hypomanic (very cheerful and lively), the syntonic (realistic, practical and humorous) and the soft-melancholic (sad-relaxed). To all three groups of cyclothymes, interest in the external world, openhearted sociability and good nature are common features. In contrast to this, the schizothyme temperaments have common inclination to autism, that is, to keeping themselves to themselves, to shy withdrawal from their fellowmen, and to humourless seriousness. Their range of temperaments is not between gay and melancholy states, but between hypersensitiveness and dull, phlegmatic conditions. From this range results the three-fold divisions of temperaments: Hyperaesthetic, that is, highly strung and with a sensitive inner life; then the middle position occupied by cool active men of decision, inclined to consistency in thought and general systematization; and finally the anaesthetic temperament, expressed in the distorted, eccentric, the dull and indolent waster." (p. 53) \*

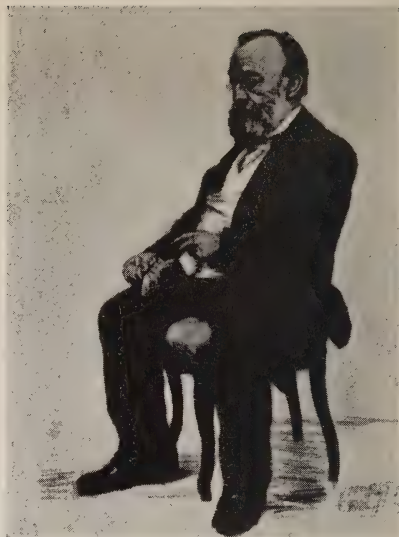
\* From Kretschmer, E. *The psychology of men of genius*. Harcourt Brace, 1931.



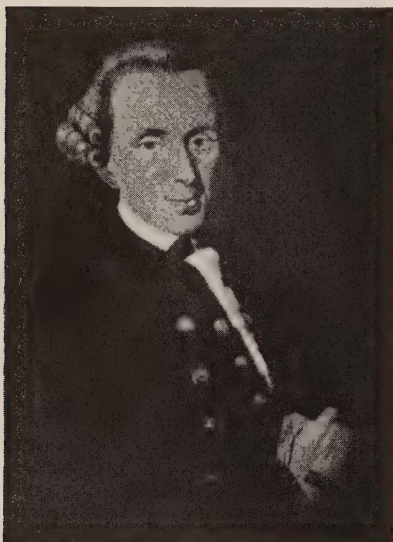




Goethe's mother. Cyclothymic artistic temperament . . . "many of these cheerful natures have . . . a permanent melancholic element somewhere in the background of their being." (94, p. 126)



Keller. Cyclothymic realist, whose work is "sprinkled through and through with humorous touches." (94, p. 220)



Kant. Schizothymic, pure idealist . . . "with Spartan freedom from desires, childlike simplicity, and the most genuine idealistic morality." (94, p. 240)



Kleist. Schizothymic tragic dramatist. "Variation toward infantilism" (p. 195) . . . "torn, pathetic and highly dramatic figure . . . in whom tenderness of spirit is as marked as the will to power." (95, p. 25)

Kretschmer uses the terms "cyclothyme" and "schizothyme" to cover the whole field of mental dispositions and temperament; "cycloid" and "schizoid" as corresponding borderline conditions, and "circular" and "schizophrenic" as corresponding insanities. The following table will help to bring out his point of view:

TABLE 82

TYPES OF CONSTITUTIONS AMONG THE HIGHLY GIFTED \*

T	Cyclothymes		Schizothymes	
Literary men ....	Realists		Romanticists, writers of extreme pathos.	Formalists
	Humorists			
Scientists .....	Empiricists describing things just as they appear		Exact logicians	
			Systematists	
			Metaphysicians	
Leaders .....	Tough, pushful men: Happy-spirited organizers. Judicious and understanding mediators		Pure idealists	
			Despots and fanatics	
			Cold calculating men	

\* From Kretschmer, 95, p. 55.

A recent book by Stockard (157), an American biologist, also discusses variation in personality in the light of body build. Stockard finds predominantly two different patterns of growth reaction which result in two qualitatively different types of personality. These he calls the linear or long-headed type; and the lateral, or wide-headed type. The latter is the more recent in evolutionary development, and may be connected with man's tendency to migrate inland, away from the sea; especially so in central Europe, a region in which the thyroid gland is physiologically less active, and colloid goitre is more common, and a lateral or more rounded type of body is the result. The functionally active thyroid, found in maritime areas, is more apt to be associated with linear body structure. However, a complete analysis of genetic bases and developmental influences has not yet been made.

Stockard recognizes also that between his two extreme types there are many gradations, variations, and blends. And, too, he is not unmindful of the modifying influences of environment in shaping ultimate behavior; nor of the differential behavior resulting from similar influences on dissimilar genetic constitutions and at different age levels. He offers a very illuminating illustration of the modifying effect of alcohol at different stages of prenatal and postnatal constitutional development. At any early prenatal stage, a dose may cause the egg to give rise to a non-viable double-headed monster; later, a similar dose may produce a defect of the central nervous system; while postnatally, it may temporarily

upset the digestive functioning of the infant; and to the adult bring, not harmful, but pleasureable sensations. Throughout it all, individual eggs differ in their susceptibility to environmental influences, especially to mild conditions.

The close connection between body build and endocrine balance has already been touched upon (p. 35). And when endocrine functioning or malfunctioning has manifested itself during the physical growth period of the child, an expectation of agreement between body type and glandular make-up is reliable; but it sometimes happens that glandular malfunction occurs long after the age of physical maturity, hence it may be expected that glands and body "won't match"; that behavior will be less closely linked with physical body type than with current glandular functioning or malfunctioning, since these ductless glands have been shown to have such significance, basic to personality expression.

### Glandular Constitution

The most imaginative exponent for the regulation of personality by ductless glands in Berman (21), who writes:

"Three sets of material or substances contribute to the creation and sustenance of individuality. These are the chromosome materials in the fertilized cell as which the individual commences his being, the nerve materials which keep him in touch with the outside world, and the glandular materials, the products of the glands of internal secretion, which are the regulators of his chemistry. The bulk of the evidence demonstrates that the changes in constitution and personality in the embryo, the child, the adolescent, and the adult, producible by changes in the glands of internal secretion, far outnumber changes elicitable by other agencies. (p. ix)

"No one denies the possible and actual influence of other agencies. It will be found, however, that when the changes, provoked by these other agencies, cannot be traced to their effects upon one or another of the glands of internal secretion, they form a class distinctly in the minority. As the key points of his chemical machinery, they are the mediators, not only between the individual and his heredity, but also between the individual and his environment. No one, therefore, can exaggerate their significance." (p. x) \*

Berman's claims are so far-fetched and premature that it seems wiser to draw from a somewhat more conservative authority on the influence of glands. Timme's point of view as set down in his little text (162) has been abstracted, and is here presented to the reader.

Timme gives details of the psychic make-up which can be

\* From Berman, L. *The personal equation*. Allen and Unwin, 1925. Also D. Appleton-Century Co.



expected to follow certain stated conditions of disturbances in each of the ductless glands of internal secretion: The *thymus*, located in the thorax; the *pineal*, in the head, back of the eye, within the brain substance, but not a part of it; the *pituitary*, in the head, toward the base of the brain; the *thyroid*, in the front of the neck, beneath the larynx; the *parathyroids*, four in number, minute glands adjacent to the thyroid; the *adrenals*, two glands in the abdominal cavity, above and adjacent to the kidneys; and the *gonads*, or sex glands,—the ovaries in the female and testicles in the male.

The ductless glandular system is a coöperative agency, and works as a system rather than as so many independent entities each on its own. Consequently, it often happens that a weakness or malfunctioning in one gland is compensated for by an over-activity in another gland. Hence the problem of diagnosis and treatment is often a very complicated matter.

However, Timme attempts to take the separate ductless glands, one by one, and to portray their chief rôles, cautioning at the same time that interpretations must always be made in the light of the evidence from all the other glands.

The *thymus* gland in the thorax appears to have a relatively short functional span in the lifetime of the individual, being greatest at birth and normally ceasing activity during childhood. While it is active, secondary sex characteristics do not appear. If the thymic gland remains active beyond its normal span of time, the individual shows certain childish characteristics, such as having a skin of soft and velvety texture, smooth face, and sparse hair. Such individuals are self-centered, childlike, simple, imitative; they need care and protection, and are often stubborn and negative. If the thymus condition persists it is characterized by low blood pressure, slow pulse, sub-normal temperature, easy fatiguability, and by hyperacidity. Such "sub-involution" of the thymus may be compensated for by the other glands whose action is opposite in effect. Then, although mental development is delayed, it nevertheless becomes effective. On the other hand, persons whose thymus atrophies too early show certain characteristics of precocious maturity. Physically they are short in stature; mentally they show much initiative, are easily angered, resentful and uncontrolled, retaining these impulsive traits throughout life.

The functioning time of the *pineal* gland is also limited but for a longer period. It ceases to be active around the age of thirty, when it deposits a "pineal sand." Not much is known about the effects of this gland, other than that it seems to be linked with the muscular

system, early development seeming to result in childish mental reactions; early cessation in deficiencies of the muscular system, unusual sex reactions, or mental precocity.

An individual with an underactive *thyroid* is sluggish, dull, more or less lethargic, especially if the condition has manifested itself early in life as in the case of cretins. Cretins are characterized by short stature, rough hair and nails, short stubby hands and poor recuperative powers. Mentally they are also retarded, usually held to a mental age below normal. Physiologically, the cretin has slow pulse, low blood pressure, a low temperature and a low metabolism. For certain cases it has been advantageous to administer thyroid, with and without pituitary, or iodine.

Myxedema is a cretinoid sort of condition which occurs later in life—usually following a thyroid disturbance marked by thyroid deficiency. It is characterized by a tendency to degenerate mentally, for “libido” to diminish, for the reproductive organs to atrophy. Administration of thyroid is often a corrective. Intermediate stages toward myxedema are influenced by physiological functionings such as menstruation, pregnancy, menopause, infectious disease, and the like. Lethargy, with outbursts of anger, often characterize this type because the victim cannot keep the pace of the swiftly moving tempo of our civilization.

The overactive thyroid, on the other hand, brings in its train physiological and mental traits opposite to those of the subthyroid. Hyperthyroid cases show heightened metabolism, increased secretions, quickened pulse, and tendency to lose body weight. Physically, these people are usually “long and lean.” Since the condition may appear at any time in life, that is, upon a body type that is already “set,” caution must be observed in what is often a conflict of evidence in the adult case. Other symptoms than body build must be the guiding factor, such as excessive perspiration of extremities, rapid growth of nails and hair, rise in temperature from .5 to one degree above normal, *etc.*

Mentally the hyperthyroid person is always busy, seldom relaxed, often troubled with insomnia at night, and very alert during the day; he (usually, she!) is easily excited emotionally, which brings on perspiration and tendency to take colds easily.

The *parathyroid* glands are attached to the thyroid and work with them in the process of eliminating the results of oxidation compounds in the body. In parathyroid deficiency, the calcium balance is increased. Behavior disorders of a compulsive nature are often correlative.

The *adrenal* glands must be considered in regard to action both of their medulla and cortex. The secretion, adrenin, of the supra-adrenal medulla brings about delayed peristalsis, lessened secretions generally, rapid pulse, higher temperature, blood pressure, and metabolism. Mentally this type is inclined to be dynamic, optimistic, easily excited, and full of initiative. Says Timme: "Such individuals are the active dynamic kind, with euphoria, initiative, optimism; easily excited and choleric." (p. 54)

If the adrenal supply is inadequate the patient fatigues easily. Fear and worry often tend still further to deplete the supply and bring further exhaustion. Timme comments:

"Their already deficient adrenals are made still more so by the drain on them produced by their psychoneurotic states of fear. The situation is one of unstable equilibrium and a vicious circle readily establishes itself." (p. 59)

The function of the adrenal cortex appears to be inhibitory and depressant to the vegetative activities of the medulla, which in a complex civilization is important; since in a social state man is not enabled to fight and use up the bodily resources mustered by the medulla and designed for use in a state of nature.

The *pituitary* gland has different functions of its own, and is closely connected with the whole endocrine system. In childhood the underactive Subject has a dry skin, a sub-normal temperature, a slow pulse and low blood pressure, and sometimes has "fits," resembling epileptic attacks. Mentally he is dull, sluggish, easily discouraged by problems, poor in self-control, and hard "to get along with." The overactive pituitary child shows opposite tendencies of precocious mental development, aggressiveness, *etc.* If hyperactivity is too prolonged it is apt to be followed by sluggishness and headaches.

The *gonads* are of value in regulating the effects of other glandular secretions; for example, luteal secretions compensate for overactive thyroid. In uncompensated states, such as during the menopause, the patient is sleepless, nervous, irritable, perspires easily, and has other vaso-motor disturbances. Administration of luteum offsets thyroid activity with pronounced effect.

It must not be thought that glands work independently as set down in the preceding presentation; rather there is a high degree of coöperation and interdependence and control within the whole glandular system. To quote Timme again, speaking of the thyroid-adrenal-pituitary group:



"This group controls quantitatively and periodically the activity of the other internal secretory organs; and the intensity, regularity and reactive capacity of the functioning of the vegetative nervous system. In short, it controls the automaticity of the individual in his adjustment to environment, in his reaction to fatigue, disease, anger and other emotions, and to competition in the struggle for existence, and prepares the organism physically and chemically to meet the shocks attendant upon it." (p. 26) \*

### Constitutional Differences in Temperament

The orientation toward "body-build" as a basis for emotional expression and individual differences in behavior does not of course preclude the theory of original innate differences among babies; overt differences have been noted even as early as at birth. To quote Woolley (176) referring to some observations of Cameron (1925):

"From the moment of birth there are clearly marked differences in nervous behavior among babies. 'One baby is placid and contented, another is fidgety, restless and enterprising.' The shock of birth, which is unquestionably present to all babies, may be very upsetting to a child of nervous inheritance, but accepted with calm by a stable, placid baby.

" 'Babies of nervous inheritance, on the other hand, will show clearly by the violence of the response provoked that their nervous system is easily stimulated and exhausted. They will wriggle and squirm for hours together, emitting the same constant reflex cry. The whole body will start convulsively at a sudden touch or a loud sound which would wake no response from a more stolid infant.' " p. 29) †

Observations on new born infants by Pratt, Nelson, and Sun (132) show individual variations, but also a generalized type of response.

Washburn (168) made monthly observations on the smiling behavior of infants from the age of eight to forty-four weeks, and concluded that the individual's characteristic behavior does not vary from observation to observation, those who tended to be sober in the first year remaining sober in the second, those who smiled easily in the beginning retaining this characteristic as time proceeded. Washburn lists several sub-groups of behavior which need not concern us here. But what is of importance is that the trait of smiling, at least, shows consistency and continuity as the organism grows and becomes subject to modifying environmental influences. How far into the future development this (and other) traits may retain their characteristicity remains to be investigated.

\* From Limme, W. *Lectures on endocrinology*. Hoeber, 1924.

† From Woolley, H. T. Eating, sleeping, and elimination. In *Handbook of child psychology*, edited by C. Murchison. Clark Univ. Press, 1931.

It would seem that individual differences in original nature can be attributed in large part to the influence of sex, race, and near ancestry. Environmental forces operate at times to conform such differences to a type, and other times to accentuate the variation. Thorndike (161) long ago pointed out that the force of environment to increase differences is less if the environmental factor is avoidable than if it is compulsory (*e.g.*, where alcohol is actually prohibited there can be no drunkards). The differential reaction of environmental forces for different individuals is also a matter of common observation, one person breaking down under a strain which the next meets with relative equanimity. Such observations drive us back again to a recognition of differences in stock which make for differences among people right from the start.

Pertinent to this problem also is the point of view brought out by Murphy (124) and discussed on pp. 275 ff. on environment and intelligence, that the more nearly similar the environment, the greater the credit which must be assigned to heredity for differences in temperament; the narrower the hereditary range of differences (such as, for example, artificial clipping off of the most unstable, the most stolid, or other extreme) the more credit must be assigned to environment for differences in temperament.

Attempts have been made to study the inheritance of temperamental traits among normal individuals, but this work, like all studies of mental inheritance, is complicated by vagueness as to what traits exist as units capable of identification and measurement from individual to individual, and to the difficulty, constantly met with, of the interfering effects of "similar" environments. However, to the extent that temperament is linked up with physical constitution—chemical, morphological, glandular, *etc.*—(pp. 362 f., 364 f., 368 f.), to the extent that it expresses itself apart from training, to the extent that it can be experimentally studied in animals, much evidence is accruing to show that the differences in temperament which are related to physical constitution seem to be inherited biologically. This does not necessarily imply that temperamental similarities are revealed in action, for here training may intrude (especially as individuals approach adulthood) to conceal their underlying 'biological disposition.'

Study of the inheritance of temperament, emotional disposition, personality (or any of the mental categories not included in the more narrow concept of "intellect") is closely bound up with the study of heredity in mental disease. Here the personality symptoms are exaggerated and more easily recognized; the threshold of emo-

tional expression is lower as a rule than in the normal group, and identification of types more readily conceded by observers. There is a fairly extensive literature on the re-occurrence of mental disorders from generation to generation, a literature which has been reviewed by Popenoe (130) and Myerson (125). The conclusions of both of these writers is that psychotic individuals, especially when reared in differing environments, tend to break down because they are born that way. Of special interest in this connection is the recent survey of Rosanoff (146) on the incidence of insanity in twins; the proportion of dual breakdown in a pair being very much higher for identical than for fraternal twins. Lange (98) in Germany has also disclosed a similar trend for twins, one or both of whom became criminals.

It would seem, from such evidence, that there is a tendency for individual temperaments to be predetermined, to grow and develop according to genetic patterns. The fact that individuals vary in personality within one family group is no refutation of this theory. Environment may be powerful to modify original nature, but powerless to change a fundamental deep set pattern, which in adulthood may be free to manifest itself even more expressively than in childhood.

There is a group of psychologists who feel that revealed behavior, attitudes, *etc.*, can be referred to a constitutional basis; they hold that certain personality "traits"—patterns of reacting, groups of disposition—have their fundamental basis in original constitutional differences. Acknowledging the powerful effects of environment, Allport (an articulate representative of this group) feels that such modes of behavior as ascendance-submission, extroversion-introversion, radicalism-conservatism, *etc.*, are "basic" to the personality, upon which in time environment interacts and builds the appropriate structural disposition. This point of view does not disregard the conditioned response manner of growing, but it presupposes a hereditary, selective basis, differing among individuals, which in itself aids or retards development along particular lines. This basis of differentiation would account also for larger differences of personality (than in mere attitude alone).

On page 381 we call attention to research evidence gathered by Allport and Vernon (12) in regard to the emergence of "types" from their data. Here we are primarily concerned with presenting some of the leading theorists and an example or two of their theories. Chief among believers in "types" are German psychologists, Jaensch, Spranger (Kretchmer already discussed), Stern, Klages,



*etc.* We cannot discuss them all but will limit ourselves to a brief consideration of the position of Jaensch and Spranger.

### Eidetic Types

Because of Jaensch's studies of the relation between personality and endocrine function his investigations of eidetic types can be considered as belonging to the field of personality psychology. "Eidetic individuals" are persons who are gifted with "*Anschauungsbilder*," or eidetic images (E.I.). This phenomenon consists of an ability or tendency to "see" objects when they are no longer actually there to stimulate perception; to "see" with almost as much clearness of detail as though the object were actually present. This "gift" is found in young people—usually pre-adolescent—and rather rarely among adults. The "acme" or age at which it seems to be most prevalent is set at twelve years by some investigators, and more recently at six years by others.

Briefly, the procedure for evoking an eidetic image is as follows: The Subject is required to concentrate his visual attention on an object of either two or three dimensions, then to close his eyes, or else to gaze fixedly at a blank wall of neutral color. Almost immediately, for some cases, and within a few seconds for others, the object is seen on the wall, or screen, or closed eyelids, with as much clarity as though it were actually "perceived."

Here we may digress for the moment to point out various types of "seen" responses. Common to all seeing mankind is (1) the "percept," that is, an object actually present and revealed in the normal manner to the eyes; (2) an ordinary "visual-memory image," which again all of us have experienced in greater or less degree with regard to objects seen. The visual memory image is merely the remembered picture of the object, and may be easy or hard to recall, depending on whether or not we perceived it clearly in the first place, the length of time we looked at it, the interest we took in it, the attention we paid to its details, and so on. (3) Almost everyone can readily identify the phenomenon known as the "memory after image." This differs from the "imagined" memory images of (2) in that it is actually *seen* on the wall in front. To get it, one stares fixedly at a colored object, preferably for initial experimental purposes, a red object. Then one transfers one's gaze to a neutral background, such as a wall, a screen, a sheet of blank paper, *etc.*, and one *sees* the object reflected back in its *complementary* color. That is, the red object now manifests itself as a green object. But the striking feature of this memory after-image is that it is not

"inside one's head," as it were, but beyond one's eyes. It is actually seen, projected beyond the seer. It is this objectivity of the "memory after image" which is so inherent a part of the fourth group of images, namely, the "eidetic image," first emphasized by Urbantschitsch (163)—although its existence was earlier recognized.

Eidetic images were later extensively investigated by W. and E. R. Jaensch and their students. Eidetic images differ from hallucinations in that the observer, although he sees them, does not actually believe in their reality.

For awhile it was thought that eidetic images were peculiar to pathological people; but the active researches of Kroh (96) uncovered the fact that they are very frequent among normal people, particularly among children (sixty-one per cent, and about seven per cent among adults). For a summary and analysis of work done in this field of exploration, the reader is referred to the work of G. W. Allport (7), of Koffka (91), and the recurring summaries of Klüver (86-90).

It may be wondered what all this has to do with personality types. If eidetic imagery is a developmental "stage" through which many people pass, then, clearly, genetic psychology will do well to observe and record the essential characteristics of this "stage," which may be more pronounced then, than at a later date when modifying influences have set in. Much speculation, philosophy, and optimism were linked up with interest in eidetic imagery *per se*, but of particular interest to the student of personality is the claim of Jaensch that eidetic individuals differ somatically. While these constitutional type differences in all their various sub-groups cannot be presented, the main symptoms of Jaensch's types can be set down.

Type one can visualize an idea, *i.e.*, he is able without apparent effort, often indeed without a preceding objective stimulus, to evoke eidetic images at will; to see what he is thinking of, and to dispel the image at will. In Klüver's (87) words:

"He can change the form, color, localization, *etc.*, of the image, if such changes are 'meaningful'; spontaneous eidetic images are viewed as 'natural' and normal; the phenomena have in most cases the color of the stimulus object; they are rich in detail and very plastic; the values for Emmert's law are about the same as found for memory images; 'fluxion' is very pronounced; the phenomena may last indefinitely, the duration depending on the person; the person's after images are generally 'normal,' his memory-images fluctuating and unstable." (p. 441) \*

\* From Klüver, H., in Murphy's *Historical introduction to modern psychology*. Harcourt, Brace, 1929.

Type two is usually unable to see the eidetic image at will. For him, E.I.'s are more like A.I.'s in that they insist on appearing in spite of intentions or efforts of the observer to dispel them. In other ways, too, they are not subject to the control of the "host"; their form and color cannot be changed, and if so, only very slowly and strenuously; they are often indistinct, complementary in color, and regarded as "uncanny." To quote again from Klüver (87):

"Emmert's law is in most cases confirmed; in general there is no fluxion; the duration is independent of the 'will' of the person; the after images last longer, and the memory images display a certain perseverating character." (p. 441)

The first is called the "B-type" and has the Basedow syndrome symptoms, such as: Change in dilation of pupils, tremor of fingers, active skin reflexes, and "respiration arrhythmia." The second is called the "T-type" (referring to tetany) and has the peripheral nerves strongly excitable to galvanic and mechanical stimuli.

From this, Jaensch assumed two "psycho-physical reaction systems." Psychologically the inner nature of the eidetic individual is held to be different; he lives in a different world. If the "meanings" and "evaluations" attached to stimuli are different, then the behavior of individuals with reference to environmental stimuli can conceivably be held to be different. The question is: Is this differential reaction between individual and environment a sufficiently defensible basis for classifying types "pure" and "mixed"?

Jaensch tells us that the achievement of certain poets and philosophers is influenced by the fact that the authors were "eidetikers." Jaensch rather prematurely builds up a superstructure of the significance of eidetic imagery for biology, sociology, history, philosophy, and education.

The present status of eidetic research can be summed up in Klüver's words (89):

"At present, Jaensch summarizes his evidence for fundamentally different modes of psychological functioning by assuming an 'integrated type' and a 'non-integrated type,' and the study of the close interrelation of different psychological functions has led him to assuming various forms of integration ( $I_1$ ,  $I_2$ , S-type, *etc.*). It seems to us that by this new effort, in which the emphasis is shifted from an investigation of eidetic imagery to an all-around genetic study of various psychological functions, eidetic research has found its proper place in a psychology of personality. It remains to be seen, of course, whether future research will substantiate results, which, at present, are more suggestive than conclusive.



"In closing, it cannot be too strongly emphasized that E. I. should not be misused as 'indications of' something, no matter whether this 'something' refers to deep-rooted personality traits or to ectodermal disturbances. In our endeavor to find 'indicators' we apparently very often forget that the phenomena have an *Eigenleben*, a behavior of their own. We believe that in studying *Eigenleben* as carefully as possible, we shall avoid contributing to a psychology of personality based on hasty generalizations." (p. 666) \*

### *Kulturphilosophie*

Social psychology, psychiatry, psycho-analysis, behaviorism—to mention a few of the leading "schools" of thought—all stress the factor of "social relations" as major determinants of ultimate personality. Of special interest, in opposition to this point of view, and rather contrary to the theories developed in America, England, and France, is the recent work of certain German investigators, who are inclined to view the "psychic attitudes" of behavior, not so much as sociological manifestations, but as expressions of natural type. We have discussed the theories of body type and personality (Kretschmer); of eidetic imagery and personality (Jaensch); but here we are concerned with the "*Kulturphilosophie*," headed by Spranger who stresses six fundamental types in human behavior. These types, he holds, are largely predetermined, but of course their actual expression can be effected only through social relations. To quote (150):

"These factors are unique objective contents of experiencing and creating that can, of course, appear only in social forms but nevertheless obey laws which cannot be deduced from the mere fact that people live and act in common." (p. viii)

Spranger approaches his organization with the *a priori* conception that there are six basic "pure types" of human beings: The theoretic, the aesthetic, the social, the economic, the political, the religious. None of these types may actually exist in pure form, but the system serves to "clarify and bring order to the confusion of complex real forms."

Spranger's basic types are not photographs of real life, case histories, or records of individuals, but are admittedly derived from an

"... isolating and idealizing method. In this way eternal and ideal types are developed which are to be used as constructions or normal structures in connection with the phenomena of historical and social reality.

\* From Klüver, H. The eidetic child. In *Handbook of child psychology*, edited by C. Murchison. Clark Univ. Press, 1931.

"We find them by considering in each case one definite meaning and value direction as the dominant one in the individual structure. And in view of our principle that in every mental phenomenon the totality of mind is somehow immanent, the other mental acts cannot be absent." (p. 104) \*

Spranger's psychological experience seems to be founded on a study of men in the abstract; to be drawn, not from the laboratory or clinic or social milieu, but from the pages of history and literature. It differentiates human beings through a study of their subjective values; it is in the common situations of life that these values are felt and indicated, and judgments thereon expressed.

As an example of how a common element or situation would be reacted to by each of Spranger's six types, one might consider the differential reactions of several people to a motor trip through a new territory. The aesthetic type would revel in the beauty of the scenery; the theorist would speculate as to its geological beginnings, and its relation to neighboring plateaux and plains; the economic type would estimate its land value, fertility, crops produced *etc.*; the social type would observe its inhabitants, their customs and play, and opportunities for social intercourse; the political type would see himself master of all he surveyed; while the religious type would see in the beauty and intricacy of the landscape the hand of God.

Perhaps a slightly more detailed description of these six basic types will indicate their fundamental approaches to life and their reactions to the experiences which life brings,

(1) The theoretic attitude, according to Spranger, is essentially that of the thinker; in its more intellectual levels it "identifies and differentiates, generalizes and individualizes, conforms and separates, reasons and systematizes." Its reaction to life is essentially objective rather than subjective, cognitive rather than affective. "Feeling and desiring, attraction and repulsion, fearing and hoping must sink into the background." (p. 111) The theoretic type obtains his thrills in solving problems, formulating theories, and systematizing knowledge. Ignorance brings despair; intellectual, scientific, or philosophic discovery brings joy. This attitude is found at its best among scholars who have chosen their life's studies; but it is not excluded from other vocational fields.

(2) The pure economic attitude stresses practical values, utilities, life-preserving goods and forces. He may be a producer or a consumer, a marketer or a "credit man." In the twentieth century he thinks in terms of agriculture, trade, industry, money. If theoretic-

\* From Spranger, E. *Types of man*. Niemeyer, 1928.

cally inclined, the economic type asks: "Of what use is such and such a fact or discovery?" The idea of the useful and productive are dominant. Allport (12) points out that the economic type is embodied in the "average American business man," who wants to know how much it "costs."

(3) The pure aesthetic type is essentially the "feeling" type as contrasted with the "theoretic" or cognitive type. These people live keenly in their emotions and color the world with their subjective point of view. Their values are to be found in grace, symmetry, harmony, beauty. Impressions are enjoyed for their own sake; not because they are significant as part of a larger series (theoretic) or because they are means to an end (economic) but because they are pleasant in themselves. Aesthetic types may be creators of art or "appreciators," but always they respond to the poetic, the imaginative, the sensuous, the rhythmic, the harmonic. "Self-realization, self-fulfilment, self-enjoyment, are aesthetic aims." Obviously these aims are bound, at times, to clash with "organized society."

(4) The social attitude is characterized by love—love of people, love of mates—maternal, paternal, and filial love; family, friendly, philanthropic love. Kindness, sympathy, consideration for others, unselfishness, readiness to serve those in need are its essence. "The self that loves is a different self from the desirous and selfish one. It is an over-self which finds itself again, enriched in the ego of another." (p. 174). In lower forms of the social type this love may be directed to only one or a few.

(5) The keynote of the political attitude is the wish for dominance, power, control over others. This type is always fighting, competing, forcing, positing its own values on others. This drive for self-assertion and self-aggrandizement may lead to the conquest of things; *i.e.*, of situations as well as of people. In his preface Spranger concedes that the "political type" readily includes the "pioneer," an especially American expression. Desire for power may vary from autocratic control over many to a consciousness of being independent and in need of nothing from anyone.

(6) The religious value "experienced as the final significance of individual existence is necessarily the highest value which the individual can possibly experience." The basic personality type, for which religious experience is the core, is partly exemplified in the mystic who finds God everywhere, something divine in every aspect of life. The total meaning of the universe is centered in God, who is best realized through negating the world because mere mind is insufficient to grasp Him. The ecstasies of the hermit are not com-



municable. Self-denial, meditation, lead to union with a higher unity beyond.

None of these types (to which Spranger devotes 140 pages of description) are complete in themselves; each type is allied with some of the others in varying degrees in different personalities. Some "attitudes" tend to reinforce one another; some to be in direct conflict with each other. But a true understanding of Spranger's system will force us to recognize the existence, if not of type, at least of values as motivating forces which are by no means the same in all men.

Interesting in this connection is the research conducted by Allport and Vernon by the use of a personality scale (11) based on Spranger's six values. The Harvard investigators established to their own satisfaction the fact of agreement between the economic and political, between the social and religious, between the theoretic and aesthetic. They found also that the social-religious attitude tended to conflict with the theoretic and that the economic-political was opposed to the aesthetic and also to the religious attitudes. Allport and Vernon think that their test brings out the dominant values in each individual, and that Spranger's position is thus experimentally reinforced.

### *iii. The Growth and Development of Personality*

Since the personality of the individual is largely a manifestation of his emotional make-up (see pp. 360 f.), its expressions and its inhibitions, its equilibrium and imbalance, and its integration and variation—its dynamic rather than its static—it follows that the student of personality, *per se*, must study not only the so-called physiological or constitutional bases of emotions, but also their genetic growth and development. Just as in the case of the intellectual functions of the individual, so too, is the emotional development inextricably tied up with the environmental factors which stimulate such growth. It is obviously impossible for any emotion, however evident its appearance at birth, to grow and mature, be stimulated and modified, without interlocking with an external medium. It is equally impossible for "growth" in the field of emotions to take place without a corresponding maturation of nervous and glandular structure in the Subject. Preceding discussion (pp. 368 ff.) showed that certain emotional expressions were directly the outcome of certain physical glandular bases—a biological manifestation. That these same physical glandular conditions are not always accompanied by the appropriate overt emotional expression is due to the

effect of training and modifying influences on the individual—a social manifestation. As an example in point, we may consider the hyperthyroid constitution which, natively, would express itself in excitable behavior; yet how many Subjects of established hyperthyroid condition are known to be calm, that is, to have “learned self-control”—to have been conditioned socially!

This example represents two extremes: The one, an uninhibited natural situation of physical cause and effect; the other, a highly artificial, restrained situation of social interference on physical structure and its consequent effect. Obviously between these two extremes are many gradations of “nearness” and “remoteness” to the natural sequence expected; gradations representing differential effects of environmental conditioning. It is manifestly impossible to detect in the behavior of any one individual the degree to which his behavior is the result of material physiological structure, or the degree to which it reflects training.

Representing the two extremes are two schools of thought: The maturationists, led by Gesell, emphasize the part played by growth of neural structure in the expression of emotion; the behaviorists, led by Watson, emphasize the part played by environmental forces. Between these two points of emphasis lie the different “social psychologists” who are more or less neutral, as regards any stress. In general they admit, whether empirically or experimentally, the innateness, or instinctive basis, of various emotions, such as fear, anger, love; and the amplification and modification of these by environment into the varying subtle shades of adult emotional behavior, known by such terms as embarrassment, sympathy, penitence, pride, jealousy, grief, and so on.

The point of view of several social psychologists will be discussed later; but first we shall introduce the reader to what promises to be our most valuable source material in the field of genetic psychology,\* namely, the body of data which is fast accumulating on the preschool ages.

### Observations of the Preschool Ages

The nursery school idea, originating as a post-war movement in England, was almost immediately adopted in America and recognized as a scientific opportunity for research in child development and genetic psychology. The nursery school forms an admirable link between home and school; it affords a laboratory for observing

\* Genetic is here used as the psychologists use it to mean growth and development rather than as used by biologists to refer to heredity.

psychological behavior during those early years which until now have been a veritable no-man's land in psychology. Previous to 1920 infancy had been descriptively recorded by lone observers, usually parents checking up developmental behavior in their own children. Children over five, entered in school, have for years been accessible to outside observers, but data on children, from one to five, have been missing.

With the origin of the nursery school, universities were quick to add to their departments of psychology a laboratory of "child development" which concentrates its energies on observing the pre-school child. General and special abilities and disabilities, social adjustments and maladjustments, personality integration, physical growth, motor coördination; factors behind behavior (for example, such things as birth order in family, parent-child relationships, social status of family, *etc.*)—these and many other things are being investigated under conditions more favorable to truth (because more subject to control) than previous data obtained for older children.

The immediate objective of these nursery school laboratories is to investigate scientifically the best methods for conserving and developing the normal child—the wholesome personality. Dissemination of information acquired in the course of their researches is correlative. The techniques of experimentation employed are largely behavioristic; that is, wherever possible, quantitative indices of behavior, and factors underlying behavior, are utilized; overt reactions are noted; the whole child as a reacting organism is observed. Situations are experimentally set up for their possible effect: control groups of Subjects are used as a check against experimental groups.

Results of knowledge gleaned from nursery school studies will probably not be fully appreciated until the first generation of Subjects has reached maturity. When enough Subjects will have been studied from infancy to adulthood, and their observed personalities analyzed in relation to influences which are known to have played upon them throughout their childhood and youth, then, and perhaps not until then, shall we have an adequate basis for generalization and deduction on the genesis of personality.

At present we are somewhat drawn between different schools of thinking in regard to personality; we learn from the extremists and we try to keep a balance between widely divergent views, each of which has something obviously valuable to offer. At the end of this chapter our discussion of the psychiatric attitude might well be enlarged to include the general attitude of the new professional in



our midst—the “child expert”—or, to be more technical, the “consultant in child development.”

For the sake of clearer presentation, we break up the “genetic psychology” group into various kinds of approach, having a little to say about each, with no final attempt at synthesis.

### Theories of Maturation

Gesell (50) recognizes the presence of certain original tendencies at birth and the social conditioning of these tendencies before growth sets in; but he insists also that due recognition be given to “the inner metes and bounds to the area of conditioning.” He (50) represents that emotional behavior, like mental and physical make-up, is characterized by a growth which is

“ . . . a function of the organism rather than of the environment as such. The environment furnishes the foil and milieu for the manifestation of development, but these manifestations come from inner compulsion and are primarily organized by inherent inner mechanics and by an intrinsic physiology of development. The very plasticity of growth requires that there be limiting and regulatory mechanisms. Growth is a process so intricate, and so sensitive, that there must be powerful stabilizing factors, intrinsic rather than extrinsic, which preserve the balance of the total pattern and the direction of the growth trend. Maturation is, in a sense, a name for this regulatory mechanism.” (pp. 291-2) \*

The infant cannot breathe whose hydrogen-ion concentration is not maintained; the physical organism cannot grow whose physiological processes do not mature with his structural growth. In the force and strength of this growth, infants are able to resist too much conditioning as well as to develop new behavior patterns. Equally basic is the fact of maturation in the development of personality processes. However, patterning of personality is much more susceptible to modification by social forces and stresses and experience of the individual than is the physical pattern. Thus growth and the final product are partly predetermined and partly undetermined by innate factors. Of the first order are “tempo, trend and temperament”; of the second are the “details in the dynamic pattern which we call personality,” and which become “defined through experience”; whose “make-up is configured by the social conditions in which the young mind grows. For all these reasons, the psychology of personality remains both a social and a biological problem.” (50, p. 293)

\* From Gesell, A. G. *The guidance of mental growth in infant and child*. Macmillan, 1930.

Gesell is more impressed by the "inevitableness and surety of maturation," which degree of determinism protects the child against disease, malnutrition and misguided management, entailing for him less suffering than he would logically derive because of our unenlightenment, and enabling him to profit from what is good in our child-welfare practices. Gesell (50) adds:

"Only if we give respect to this inner core of inheritance can we respect the important individual differences which distinguish infants as well as men." (p. 299)

Gesell illustrates his application of the maturationist point of view in regard to the development of personality by the differential emotional (fear) behavior of the infant at different age levels in response to the same stimulus situation. A baby is placed in an enclosure 2 x 3 x 4 feet, ventilated, illuminated, and open at one end. Pointing out that children are not accustomed to such a shut-in environment, Gesell proceeds to check reactions at various infancy age levels and finds that (50):

"At ten weeks he (the baby) may accept the situation with complete complaisance; at twenty weeks he may betray a mild intolerance, a dissatisfaction, persistent head-turning and social seeking, which we may safely characterize as mild apprehension; at thirty weeks his tolerance to the same situation may be so vigorously expressed by crying that we describe the reaction as fear or fright. Here then are three gradations of response: First, no disquietude; second, mild disquietude; third, robust disquietude. Is not this a genetic gradation of fear behavior which is based upon maturational sequence rather than upon an historical sequence of extrinsic conditioning factors? Such factors may account for specific aspects of fear behavior, but not for the organic pattern beneath such behavior." (p. 290) \*

Conditioning, Gesell maintains, may determine the *orientation and reference of fears*, but maturation accounts for the change which the *mode of fearing* undergoes. Fear, like prehension, is not an abstraction or a simple entity, but alters with growth.

Much the same tendency was noted by the Jones' (80) in regard to the emotional reactions of older children. The stimulus was the presentation of a snake in a suitcase. Up to two years of age, the children manifested no fear responses; from three to three-and-a-half years they advanced with cautious, tentative steps or touches; from age four on, there were definite fear reactions, especially so in the case of adults. These authors (74) interpret this progressive

\* From Gesell, A. G. *The guidance of mental growth in infant and child*. Macmillan, 1931.

fear response "as a result of a general maturation of behavior, which leads to greater sensitiveness and more discriminatory responses." (p. 74)

"The arousal of fear depends not only upon situational changes, but also upon the individual's *general* level of development. With a young infant, perhaps the only changes which are fear-producing are those which substitute loud sounds for quiet, pain for comfort, or loss of support for a previous state of bodily balance. As a child develops, his intelligence innately matures, and his perceptions become enriched through experience. New things startle him because of his keener perception of the fact that they *are* new and unusual. . . . Fear arises when we know enough to recognize the potential danger in a situation but have not advanced to the point of a complete comprehension and control of the changing situation." (p. 75) \*

This early presence of emotional reaction to stimuli which are unproductive at a later age was noted by Jones (73) in his experiments with the psychogalvanic reflex on very young infants. Jones was on the lookout for visceral rather than somatic reactions, that is, inner reactions (tension) rather than the usual outer emotional patterns of response, such as crying, squirming, *etc.* He was convinced from his work that babies' emotions are superficial, evanescent, and lacking in visceral re-enforcement. Older children who are taught to "control their emotions" by inhibiting the outer reaction—that is, by not crying—merely shift the response to the viscera. By the time a child is able to block his outward behavior, his visceral mechanisms have reached a stage of development ready to take up the responsibility. The quick change in emotional tone, so often noted in the very young, offers further support for the belief that their emotions are on the surface, unsupported by visceral tension, a tension which does not ever lend itself to such rapid readjustment.

Other experiments by Washburn (168) and Bayley (16) indicate that the increasing negativism of babies (manifested by shyness, crying, and withdrawing reactions) toward strangers, may be attributed to growth in neural structure which enables their perceptive process to increase, *i.e.*, to become increasingly aware mentally of the new elements in the situation. Valentine (164) holds that "late appearing" fears can be elicited which are not conditioned as Watson would have it. Absence of specific fears at one age does not preclude their appearing later when maturation permits; *e.g.*, Valentine mentions an "innate fear of the uncanny when his two-

\* From Jones, M. C. The conditioning of children's emotions. In *A handbook of child psychology*, edited by C. Murchison. Clark Univ. Press, 1931.



year-old son became frightened at a mask, a doll's head, which opened at the back, and detached doll's eyes."

## B. INTERPRETATIONS WHICH STRESS SOCIAL AND SOCIOLOGICAL FACTORS

### *i. Personality from the Standpoint of the Behaviorist*

Behaviorism shares in the concern of other "schools" of psychology to study how the newborn biological organism changes into an adult who must take his part in the intricacies of civilization. Behaviorism takes account of the sensory-motor equipment, both evident and latent, and the environmental forces which impinge on this equipment. Inheritance, environment, and resulting bodily changes—these three mechanically interacting explain behavior. For the behaviorists, there is no need to call on any force beyond; no need to postulate a "mind," a "consciousness," a "*deus ex machina*" to explain why these mechanisms work the way they do. In human beings, as in infra-human life, behavior becomes understandable through complete observations of bio-physical and bio-social stimuli and responses.

A stimulus (representing energy of some sort which can be measured by objective units) acting on sensory tissue, producing chemical or physical changes converted into nervous excitations, is propelled through a network of sensory, connecting, and motor neurones, and ending in muscular contraction or glandular secretion, is the basis of behavior. Each such process is capable of being a stimulus to set up other bio-physical processes, which in turn may set up still others, and so a complicated mechanism of active processes is set into operation. Bio-social stimuli, such as language, are substitutes for bio-physical stimuli (*e.g.*, a push). Bio-social responses are those contractile or secretory reactions seen by observers which have become conventionalized, or at least recognized as being common to many organisms: dancing, blushing, talking, hesitating. (170-a, p. 149 ff.)

To the behaviorist sensory-motor function is the element of human as well as of animal behavior, the element in a process by which an individual becomes a part of society. This conception of a "reflex psychology" grew out of the work of a physiologist, Pavlov.

Pavlov, a Russian, was accustomed to start the flow of saliva in his experimental dogs by the stimulus "food." He soon noticed, however, that the animals began to salivate before the food was in their mouths; often the mere sight of the food, or rattle of the

pan—even the sound of the keeper's footsteps—would be sufficient to stimulate a secretion. This secondhand type of stimulation seemed so significant to Pavlov that he concentrated his attention upon it—named it “conditioned stimulation,” and the reflex (salivary secretion) which followed “a conditioned reflex.” He experimented with these conditioned reflexes under many different controls, noting that he could condition the dog's behavior almost any way he cared to.

If, for instance, for a few occasions he offered food and sounded a bell at the same time, later the mere sound of the bell would produce the flow of saliva. Again if he struck a tuning fork of high pitch while offering food, and at other times struck a low note, offering no food, the dog would salivate for the high note, but not for the low note. The dog “learned” *without the intervention of consciousness*, to expect food with one note and not with the other.

Pavlov found also that he could “uncondition” a reflex by training. For example, after frequent association of bell and food had accustomed the dog to expect food, frequent stimulation of the bell alone caused him in time to cease salivating.

It is in this way, by associating stimuli with response, that reflexes are built up—simple and complex, and highly involved integrations of reflexes. The actual application of this theory to human behavior was carried out by other Russian investigators—Bekhterev and Krasnagorski—and in America the experimental work was headed by J. B. Watson.

It has been this insistence on a “controlled observation” of behavior, (*i.e.* by checking experimentally on initial equipment of the functioning) which has contributed most to our knowledge of the fundamental instinctive emotional make-up of human beings. It is this zeal for the “objective method” which has thrown out much of the earlier “armchair” data gathered by speculation, by introspection, or by other subjective (and to the behaviorist) “unscientific” methods.

For our purpose, Watson's chief experimental contributions are to be found in his observations of the behavior of newly born infants. Watson's experiments resulted in finding a three-fold category of “native” emotional equipment; namely, fear, anger, and love. He not only presented evidence to show the presence of these emotions at birth (and the absence of others) but also gave, in detail, the stimuli necessary to evoke their appropriate behavior. For example, to evoke rage, all that was necessary was to hold the body of the child in such a way as to hamper his muscular movements.

This was followed by a response of stiffening, crying, turning red and blue in the face. Love responses were called forth by gently stroking the sensitive and erogenous zones of the body (nipples, lips, sex organs); while fear was manifested by terrified crying in response to loud noises, and sudden loss of support.

Although these three emotions were named rage, love, and fear by Watson, he does not connote in these terms those complex emotional, adult reactions called by the same names; but beyond all doubt these elemental reactions constitute the nucleus out of which the later reactions are fashioned, or, in the language of the behaviorist, "conditioned." Other emotions, also, such as pride, grief, jealousy, shame, *etc.*, manifested at a later date in the individual's life, are also a result of social "conditioning." Watson's contribution is his insistence on the instinctiveness of these three "primary" emotions, and on the building up by a conditioning process of all others. How such conditioning takes place is revealed in the details of Watson's experimental work on Albert, a stolid and phlegmatic, but healthy infant, aged eleven months, who had been under continuous observation since birth.

Repeated tests showed that Albert feared nothing but loud sounds and removal of support; on the contrary he was prone to reach for and handle any thing which came within his reach. In the experiment a white rat was presented to him; he reached for it. Just as he touched it a steel bar was struck behind him. He jumped violently and fell forward. The rat was presented a second time, and the bar was struck; again he jumped, fell forward, and this time whimpered. Ten days later the rat was presented without sound. Albert looked at it, but did not touch it. Nearer placement induced him to reach out his left hand and then to withdraw it. This behavior did not occur in response to his toy blocks. Several repeated combinations of rat and steel clang soon caused the child to cry at sight of the rat alone, and to crawl away as rapidly as he could—convincing proof that his fear response had been effectively "conditioned." This fear was shown five days later toward a white rabbit, a dog, a seal coat, some cotton wool, and a Santa Claus mask, showing how emotional responses are "transferred" to other stimuli having a common element running through them (in this case "furriness").

Watson offers this experiment as typical of what can happen in the ordinary situations of life, to account for many vague and unreasonable fears and sensitiveness, for which no adequate basis can be detected. A clap of thunder, a door banging, a scream cou-



pled with the situation of the moment produces fear; later the situation, unaccompanied by the noise, is sufficient to set off the fear response. But because we are unaware of the original linkage, we are unable to explain the fear. We may not have noted the concomitancy of the two stimuli, we may have been too young to formulate it in words, we may have forgotten the occurrence, but our nervous systems have registered it indelibly.

During such an experience other changes are being set up within the organism—changes not visible to the observer, as are overt reactions of arm and leg and vocal gestures. Certain changes in pulse, blood pressure, respiration, glandular secretion, visceral tension, and a large number of intraorganic reactions, all contribute to the inner feeling of fear. (See Cannon's work page 363.) It is maintained that almost every responding organ of the body can be "conditioned"; organs over whose activity we have no voluntary control, such as the glands and unstriped musculature. The response is direct, often immediate, and does not require the intervention of "verbalized ideas"; often indeed a realization of what is taking place does not penetrate into consciousness, although the association of unrelated stimuli may later be traced and recognized to account for one's "mood" or "feeling tone."

Who is there who has not at some moment in his life heard a tune, smelled a perfume, felt a tactual sensation which has not instantly been accompanied by a feeling of sadness, gladness, anger, or fear? The emotional response, because of its incongruity at the moment of appearance, attracts the attention of the Subject, who, if he were able to investigate it and trace it, might connect it with an event of years before, when the tune was heard, or the fragrance smelled, to the accompaniment of an emotional childhood or adolescent episode.

Marcel Proust (138), after a weary day, tasting the madeleine dipped in his tea, is instantly transported into a state of exaltation and unexpected joy, which on analysis is referred to his childhood. This transition is explained by Proust as "sub-conscious" intervention; to the behaviorist it is much simpler, and is easily explicable in terms of "conditioned responses."

The chief thing to bring out in the discussion is that from birth on, perhaps even before birth, responses to two or more factors in the environment become "conditioned," attached, associated; usually without our knowledge. Later when one factor appears alone, the response to the other factor also appears. In this way hundreds, thousands, of reactions become tied up in various combina-

tions which reflect themselves in non-verbal behavior habits and attitudes, as well as in verbal expression of ideas. By adulthood it is doubtful if any new stimulus could be made to evoke a "native" response, because some element in that stimulus will already have associated itself with earlier behavior. It is for this reason that the behaviorist holds as enormously important the conditioning which takes place during the first two years of the child's life. Watson is extreme in holding that within the first two years of life, the child's temper, his vocational interest, his character, his positive bent toward things are so slanted, "that only a divine being could unmake him and give him over to a biologist as new material fit to watch for the unfolding of family traits."

Again (p. 303) he contends that by providing suitable surroundings (obviously different from those which obtain today!), by setting up conditions which are not determined by custom and tradition, he could shape a rich and wonderful personality for every healthy individual. Watson, the behaviorist, accounts for the individual differences among adults as the results of differential opportunities and environmental training since birth.

Personality then is the "end-product of our habit systems." We study an individual's personality by observing his activities. Among the manifold activities, however, are dominant systems in the manual field (occupational); in the laryngeal field (great talker, raconteur, silent thinker); and in the visceral field (afraid of people, shy, given to outbursts, having to be petted, and in general what we call emotional). These dominating systems are obvious, easy to observe, and they serve as the basis for most of the rapid judgments we make about the personalities of individuals. It is upon the basis of these few dominant systems that we classify personalities.

Watson's stress on environmental conditioning as the essential basis of emotional life may be what the psychoanalyst would call an "over-compensation" against the hereditarian stress on genetic factors. However, Watson has served to shake off the traditional point of view against the inevitableness of hereditary predetermination of personality. A child's temper can no longer be excused because he "takes after his father." Nowadays, some child experts are leaning over backwards; rather it is the father who can no longer be excused for allowing his child to be conditioned that way; or, at least, for not unconditioning him once the temper symptoms become strongly objectionable.

*Unconditioning.* How such unconditioning can be made to take place, how personalities can be re-made, behavioristically speaking,

has been studied in the work of M. C. Jones, (78) who carried out her experimental projects under Watson's guidance with the aim of a better understanding of how to remodel personality. This is essentially an attempt to "unlearn" certain emotional habit or attitude patterns, and to substitute in their place newly acquired ones. Jones, working with children older than Watson's infants, extended the range of stimuli to include flashlights, mechanical toys, stuffed animals, false faces, darkness, *etc.* Again the common element productive of fear response was "suddenness and unexpectedness" of action, as, for example, when a frog jumped.

It was relatively simple to condition a fear; but the experimental technique of unconditioning had to be established. Jones found that merely allowing the child to become accustomed to the fear stimulus (rabbit), forcing it to be near the rabbit, watching other children play with the rabbit, or ridiculing the fear of the rabbit, all had relatively little effect in uprooting the fear reaction. But by coupling the stimulus rabbit with an elementary pleasure reaction, such as eating food (*i.e.*, in other words by reconditioning the stimulus with a strongly pleasant emotional tone) Jones was able to eradicate the fear. This recombining was, of course, introduced judiciously and mildly; tolerance was established gradually by having the rabbit (at first) in a cage on the far side of the room while the child was placed before its food. Day by day the rabbit was brought nearer at lunch time, until the child was able to take it in her arms and the fear was gone forever. Hence the attempt at changing personality must be based primarily on the principle that it is necessary to break up the present system of habits by compelling the Subject to adjust to a new environment. Watson (170) himself instructs us that to change personality it is first necessary to change environment in such a way that new adaptations and habits are called for. (p. 302) He foresees a time when we shall have special institutions devoted to the problem of reshaping psychological characteristics just as today we have plastic and other surgeons who change physical characteristics.

Watson is prepared to face the objection that individuals can take their "internal environment with them in the shape of words and word substitutes." The objective aspects of implicit behavior are inner speech—movements of speech organs which constitute "thinking" and "implicit visceral reactions" which make up "feeling." This internal environment is influenced by such forces as friends, teachers, theatres, movies, *etc.* Without exposure to stimuli of this sort there will be no change of personality. (p. 302)





Disgust

Mirth

Mirth

Disgust



FIG. 32. THE RÔLE OF EYE MUSCLES AND MOUTH MUSCLES IN EMOTION, SHOWING DISGUST AND MIRTH. From K. Dunlap, *The rôle of eye muscles and mouth muscles in emotions*, *Genetic Psychol. Monog.*, 1927, 2, pp. 214, 220. Courtesy of Clark Univ. Press.

Elsewhere (170) Watson observes that change in personality is most effective if the attempt is introduced early, while the individual is still in the plastic age. After full maturity, about age thirty, people have settled into a routine to which their habit patterns are also set. Hence, on the average, few people change after thirty. (p. 278)

*ii. Personality from the Standpoint of the Gestalt Psychologist*

The Gestalt psychologist has brought psychology back from the external to the inner experience of the individual. What the latter feels, thinks, *etc.*—ignored by the behaviorist—is of direct concern to the Gestaltist. Coherence of behavior was explained by the behaviorist by “connections,” or “conditionings,” which are more or less automatically set up. Behaviorism finds it unnecessary to postulate an “experiencing individual” (consciousness) as a reference point to which behavior is to be attached. The Gestaltist, on the other hand, cannot think of behavior apart from such an experiencing individual.

Gestalt psychology is also a revolt against earlier associationist schools which attempted to reduce things (matter, force, experience, processes, *etc.*) to component elements. Mind at one time was considered to be made up of so many functions; each function in turn was analyzed into separate elements: sensations, perceptions, images, *etc.* Analysis of that day would reduce every kind of mental experience to its psychological atoms, and then synthetically rebuild to explain human make-up. Not so the Gestaltist who sees in such analysis the establishment of artifacts. You cannot break up any whole into its separate parts and then assume that the sum total of these parts constitute the whole. If so the chemist’s job were easy! Potatoes may be made of starch, sugar, water, ash, *etc.*, but put these together in appropriate quantities and you do not get a potato!

There is something over and above summation of parts which makes up a whole; there is the attachment and integration of parts one with another. By breaking a thing up into elements, one destroys the concept one is trying to explain. Elements must be held together by something; it is this assumption of a “tying-togetherness” which, in itself, cannot be explained; which, in essence, distorts the interpretation of a “whole being made up of the sum of its parts.” Gestalt, whether of physical or psychological data, implies an inherent interrelation or wholeness of structure and function. Gestalt psychologists refer to the work of earlier “associationist” schools



as a "brick and mortar psychology," with emphasis on the bricks, but no light on the mortar.

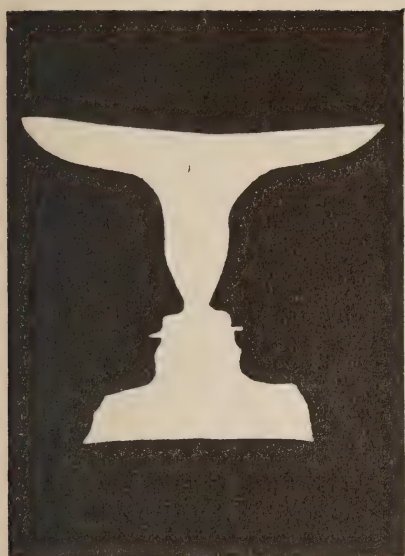
The "*Gestaltqualität*" is the "pattern quality," possessed by the whole, which could not be possessed by its parts. A melody is a sequence of notes—a pattern, a form not inherent in any one note, but which may be inherent in an entirely different set of notes (*i.e.*, if key is transposed). Or again, the same notes in a melody may be redistributed into many new and quite different melodies. The tune, in itself, is a *pattern*, a Gestalt.

For this same reason one is reminded of the injustice continually effected by removing a quotation from its context; by evaluating a speech, when only the first or last sentence has been heard; by interpreting behavior when only part of the body can be seen, as when a hand is thrust out from the driver's seat in a moving automobile: to the driver's companion it is but a gesture of excitement during a discourse; to the car behind it is a traffic signal! Dunlap (34, p. 197) has supplied us with interesting pictures to show that the expression of a part of the face becomes meaningful, only as the whole face is seen.

Nor is the process of apprehending the whole a matter of passing very rapidly from part to part, as might be supposed. First the whole is seen as a whole, and later, parts may be isolated for inspection. This applies to reaction to time as well as to space. Wertheimer (175) early pointed out that when two stimuli came at suitable intervals, the mind responded to the two positions at once. It is in this manner that motion is sensed, the "primary reception process of the brain was a moving or shifting process." (175, p. 101) Such an explanation is more readily accepted when one inspects the separate negatives of a cinema film and fails completely to get the effect of continuous motion which is felt when the reel is projected in suitable time intervals.

The following pictures reveal how identical parts (in space) may, even in totality, embody two different Gestalts. As one looks at the arrangement "goblet," one fails to see "profile," and *vice-versa*. At no minute can the observer apprehend both simultaneously. Something within him determines which meaning it shall be. Differential interpretation entails differential response: he may like the picture of the young lady, yet be indifferent to the face of the old woman, in the alternate picture. He may be repelled at the sight of the brains, yet fascinated by the babies in the third picture.

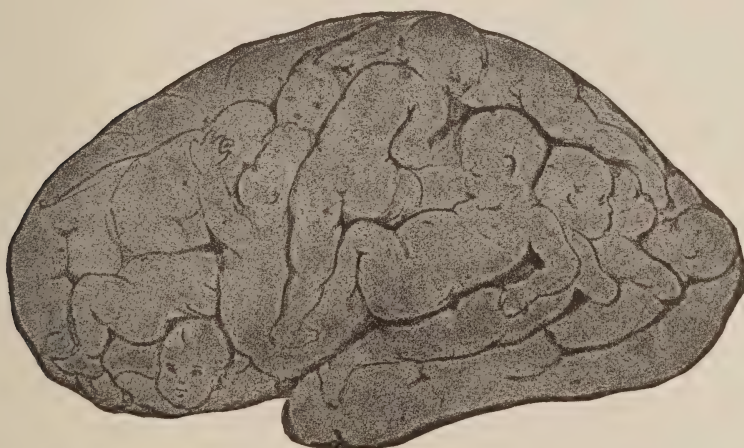
But in this chapter our concern is to apply the logic of Gestalt to the psychology of personality. Gestalt psychology holds that



GOBLET PROFILE. From E. Rubin, *Visuell Wahrgenommene Figuren*. Courtesy of E. Rubin.



ALTERNATING FACES. From E. G. Boring. *An Ambiguous Figure*. *Amer. J. Psychol.*, 1930, 40. Courtesy of *Amer. J. Psychology*.



BRAINS. Drawn by R. Gudden, Frankfurt, M. Taken from Titchener. *Text-book of Psychology*, 1919. Courtesy of The Macmillan Company.

FIG. 33. AMBIGUOUS PICTURES.

personality is not a mere sum of separate traits (however accurately these may be measured!), but an organized whole, which includes the relation of one trait to all the others, and of the organism to its environment. Personality is an "historical and experiential" continuum—a Gestalt.

Köhler, a leading spokesman, brings out the above point (92):

"... in studying the properties of a nerve muscle preparation, we are investigating 'a part of' natural behavior, because physiologically its properties are not only simpler but also radically different in some respects from what they would be if the same nerve and muscle were contributing to normal behavior. It is the *whole* organism; as some behaviorists have rightly said, the behavior of which is our subject matter. But in the whole organism one can seldom follow the change of one variable alone as the consequence of one change in outer conditions. The change in one factor usually involves concomitant change in a great many others, and these affect the first retroactively." (p. 45) \*

Similarly, the person alone, apart from the environment with which he interacts, is a meaningless fiction. His behavior, his motor activity, his personality, is dependent on his sense perceptions, his physiological organism, his past experience, and the present situation, all woven together and inseparable from the standpoint of interpretation. In short, a complete dynamic organization, which when attempts are made to consider it in disintegration, loses its meaning.†

Lewin (106) brings out still another point: namely, that what are ostensibly similar environment factors become decidedly different ones for different people when reflected in the *needs* of the individual reacting toward them. It is this individual coloring of environmental object, this "valence" as he calls it, which becomes its most important property in the subjective reacting situation. Lewin recognizes positive valences (effecting approach, *e.g.* eating, grasping) and negative valences (resulting in withdrawal, fear, annoyance) which determine the *direction* of the individual's behavior. Each time an environmental factor acts on the Subject, the latter becomes changed and presents a new "basis of reactions" for future situations, both favorably and unfavorably inclined.

Lewin (106) speaks of a "circular causal relation between self and environment":

\* From Köhler, N., *Gestalt psychology*. Liveright, 1929.

† This conception is distinctly in line with clinical psychology's (see pp. 438 ff) attitude toward delinquency and other behavior—namely, that "the whole child" must be taken into account, and always in relation to the total situation (past, present, and future) in which he is found.



"The less intelligent child is not only less able, but the actual demands made upon him by apparently the same problem are usually really greater than those made upon the intelligent child. The poorer solution of the weaker child thus usually has the double character of an '*inferior performance*' of a '*more difficult task*.' (p. 124)

"Quite analogous cumulative series due to this vicious circle may be seen in psychopathic children or in other children that have difficulties in social groups. The over-excitabile or socially disagreeable child is not only less competent in his social situation (thus making his task the harder) but the other children reject him, drive him to a defensive attitude, *etc.* The child soon gets himself into a social situation, originating perhaps in some quite trivial conflicts that would tax the capacities of a child of high social endowments." (p. 124) \*

Similarly to mention other examples of Lewin, this kind of unfavorable environment reacts circularly on stammering, causing more trouble with each renewal; and conversely, favorable responses to the gifted child set up even more favorable conditions for the future. It is obvious that injuries and disadvantages set up by this circular causal relation should be ruled out as much as possible, if the child is to grow.

It is this direct interaction between an "experienced" individual and a situation which is of decisive importance in understanding the *dynamics* of behavior; and since no two personalities are psychologically alike, no two reactions can be explained on exactly the same basis. The Gestalt psychologist would point out that the law of falling bodies (illustrated on our p. 359) takes account of both medium and reagent; it does not mix unlike reagents (feathers and stones) and average the results, as statistical psychologists have done for individuals in their zeal to obtain averages. The Gestaltist holds that such mass averages iron out individual variations in "psychological structure"; environmental forces, extrinsic to the Subject, are studied by the statistical psychologist as though their influence on reagents were constant. The Gestaltist would remind us that even among originally similar genotypes (homologous human beings) sensitivities to environment are altered by such things as maturation of structure, experience which backs up insight, momentary mood, *etc.*

An inference, therefore, from the "average" to the particular case is impossible and valueless. The concept of the average child and of the average situation are abstractions that have no utility

\* From Lewin, K. Environmental forces in behavior and development. In *A handbook of child psychology*, edited by C. Murchison. Clark Univ. Press, 1931.

whatever to the Gestalt psychologist for the investigation of dynamics. (p. 95)

To quote again from Lewin (106):

"The dynamics of environmental influence can be investigated only simultaneously with the determination of individual differences and investigation of general psychological laws."

Köhler (92) presents a similar argument:

"Once more I must point out that our feeling of something naturally depending upon something else does not refer to a correlation, or a highly constant 'togetherness' *as such*, stated in terms of the external observation of a great many cases. It refers rather to an evident dynamical dependence as experienced *hic et nunc* in one actual case. . . . The way in which a piece of music affects me now, in contrast to the attitude it produced twenty years ago has been determined by some change of myself." (p. 361)

### The Laws of Human Nature

Wheeler (173) has attempted to sum up the laws of human nature as a Gestaltist would see them and to apply these organismic laws to the development of personality. Again and again, Wheeler emphasizes that the laws of physical energy can be transferred to "organisms," personal and social, which in themselves are energy systems. When a man moves or speaks, such purposive activity expresses a *potential* in much the same conception as is to be found in meteorological, magnetic, temperature, or gravitational fields. We offer a few excerpts from Wheeler's (173) book (which unfortunately takes no account of experimental research effected by the Gestalt school), which describes the new unit of behavior as a

"complex whole, not composed of parts, but producing them: not made of parts but capable of differentiation. This descriptive unit is dynamic, not in a vitalistic sense but in an organismic sense, for dynamic properties are describable and measurable only in *terms of differentials in energy potentials*. Each whole is a field differentiated into alignments of potentials, or structurisations of energy, known as phenomena. Each potential is a relative thing; it is definable, in fact exists, only in terms of the whole, that is, through the organic character of the whole." (p. 62)

"Unity is a matter of *form* existing under organismic laws of dynamics." (p. 63)

"Each whole or unit has a form or configuration of its own, a phenomenological whole-character, and its unity accrues to organization. . . .

"Where details are useful for a more thorough understanding of an object or an event, analysis is justified; but if an explanation is to be sought in the products of analysis, the searcher is doomed to failure. The explanation can be found only outside, not within, the thing to be explained." (p. 65)

"The laws of dynamics describe, in universal terms, the behavior of energy systems. The unity of these wholes is dynamic, a matter of organization with heterogeneity of structure, not a matter of unity in the sense of non-reducibility and indivisibility of structure as characterized the old concept of unity. Such a whole would, by definition, be homogeneous in structure." (p. 70)

"Configurations are temporal as well as spatial units; they are structured in time as well as in space." (p. 91) \*

The eight "organismic laws" which Wheeler has enunciated as applying to human behavior are taken from the dynamics of wholes as found in engineering and in nature. Wheeler consistently maintains that *human nature is like any form of nature*.

1. *The Law of Field Properties*. Any item is more than the sum of its parts. Personality is a part of, and exists only in relation to a dynamic whole, a society, a "field of personalities." Human nature is a phenomenon of group and not of distinctly individual behavior. Tarzan among the apes, or abandoned children, reared by wolves (151), are not like human beings, but like animals in their behavior.

2. *The Law of Derived Properties*. Parts derive their properties from wholes. The infant begins life with an undifferentiated personality whose potentials are the direct contribution of heredity. Growth soon evokes from this beginning a pattern of behavior which is largely the reflection of the individuals around him. Gentle, comfortable, orderly procedure results in a quiet, happy and temperate personality; harsh, depressed, uncontrolled companions set up hyperirritable reactions in the growing child.

3. *The Law of Determined Reaction*. The whole governs the activities of its parts, e.g., "The outstanding qualities of the leader exist only in relation to the mediocrity, needs, and potentials of the group." Society imposes dress, language, religion and moral ideas, type of etiquette, conventions, education, etc., on its members.

4. *The Law of Individuation*. Parts emerge from wholes through a process of differentiation. Variations in the social pattern of human nature set up individual variations. Position in a family sib-ship, for instance (the position of one member with respect to

\* From Wheeler, R. H. *The laws of human nature*. Appleton, 1932.



the whole), may be a striking factor in setting up individual differences.

5. *The Law of Field Genesis.* Wholes evolve as wholes. There have always been social groups, which develop language and thought and other complexities of expression. Similarly the initially undifferentiated personality develops into a more complex being, *e.g.*, "General activity *versus* sluggishness differentiates into stubbornness, aggressiveness; and brilliance *versus* docility, into passiveness, and lack of alertness." (p. 218) After passing through adolescence and making contact with a wider environment than the home affords, the individual manifests either more refined or more objectionable traits.

6. *Law of Least Action.* Tensions within the personality system demand resolution in the most direct way. A person who finds himself unable to conform to the group or to the demands of life about him develops tensions and conflicts. These are often resolved by retreat, withdrawal, physically or psychologically from the stimulus. He may "go back home," shut himself up in day-dreams; or so modify his thinking that he closes his mind to his unsuccessful encounter with reality. Wheeler holds:

"The higher the level of intelligence and culture, the more complex the goal activities. This means that civilized man has a greater variety of tensions, more worries, more troubles, than primitive man; conversely he has more satisfactions and enjoyments, upon being released from strain. The critical intelligent person undergoes more conflict than the feeble-minded or the ignorant." (p. 220)

7. *Law of Maximum Work.* When the personality suffers any disruption of behavior pattern, when the balance of energy is disturbed, the potential of the whole system is utilized to reestablish balance. We are all familiar with the multiplicity of muscular tensions put into operation during any new learning (*e.g.*, in swimming, far more muscles are employed than are actually required for the swimming reaction). In a similar way, people resist being compelled to submit to new ideas which are being forced on them from without, rather than being permitted to assimilate them through a slower process of growth. "Insight" is the change which characterizes the whole as it grows progressively.

8. *Law of Configuration.* Discrete and isolated elements are purely fictive. The simplest unit is a dynamically integrated unit affecting and being affected by another system as a whole. No "element" is out of relation to anything else. Change in one whole

is always in response to a total set of conditions. Interpreted in terms of human behavior: "Any reaction of the human being is a reaction of the organism-as-a-whole, and is a unified response to a total situation of some kind. If the response is directed specifically toward a detail of the total situation it is always made to that detail in relation to other details." Particular characteristics develop in relation to all aspects of a social setting. The short man, without superior abilities, develops a blustering attitude; whereas his equally short, but intellectually gifted brother, having qualities which command respect, will not resort to this kind of compensation. He will not need to!

Wheeler illustrates the operation of his eight organismic laws by citing the case of a refined sensitive boy, who, at four years of age, was molested and bullied by rough companions having very little in common with him. The boy sought refuge in his mother's sympathy and by avoiding the tormentors, but they continued to jeer at and trick him. Even removal to another environment failed to be curative, for his "defense mechanisms"—withdrawal from others, suspicion of malevolence and a compensating intellectual brilliance in study—were already set. He retreated into a phantasy world of his own and lost all social insight, being unable to recognize genuine friendliness when it was extended to him. At college this attitude of hatred, fear, and suspicion increased, and because of his "queerness" the hatred became mutual and resulted in quarrels which precipitated the Subject's complete mental breakdown.

Wheeler interprets this case history as the struggle of a human energy system to maintain its organization during maturation. Deriving hostility from outside companions and gentleness from home resulted in a breaking up of the boy's personality into two sets of patterns, wherein the only unity was the self as a point of reference.

"Human nature decays in isolation. The boy . . . was depriving himself of a personality because human traits depend upon dynamic relations with a surrounding human-nature-pattern. As the seclusion went on, the human aspects of his nature disappeared. If he should continue in this direction, in the end he would lose all contact with his environment, refuse to recognize people, show no interest in them, decline even to talk, eat, keep himself clean, or care for his bodily needs. In other words, without stimuli from outside, the potentials necessary for a personality were losing their differential. They were changing to a state of homogeneity, which means, in the end, inaction and death." (pp. 211-12) \*

\* From Wheeler, R. H. *Laws of human nature*. Appleton, 1932.

Gestalt psychology, although responsible for a large body of experimental material in the field of learning and adaptation, has not as yet engaged in much research on the development of personality from the Gestalt point of view. Its adherents have been busy with the exposition of the logic of their science—already enunciated with characteristic German precision of detail in the field of learning. That we may hope for a rich future program in personality study is indicated in Köhler's (92) stand:

"Wherever a process dynamically distributes and regulates itself, determined by the actual situation in a whole field, this process is said to follow principles of *Gestalttheorie*. In all cases of this type the process will have some characteristic which exists in an extended area only, so that a consideration of local points or local factors as such will not give us full insight into the nature of the process. From this viewpoint even the segregation of circumscribed wholes becomes one more or less particular, though highly important, case among the various possibilities which are included in the most general index of self-distribution and self-regulation, and in consequence, the concept of *Gestalt* may be applied far beyond the limits of sensory fields. According to the most general definition of *Gestalt*, the processes of learning, of reproduction, of striving, of emotional attitude, of thinking, acting, and so forth, may be included as subject matter of *Gestalttheorie* in so far as they do not consist of independent elements, but are determined in a situation as a whole." (p. 193) \*

### iii. *Personality from the Standpoint of the Social Psychologist*

It will be remembered that Watson's criterion for an instinct was that it should be present at birth, that is, before an opportunity for "learning," "conditioning by environment," had had a chance to set in. Other writers would hold to other criteria—would admit that certain reaction patterns may be instinctive even though these were not present at birth; that, in short, some instinctive reactions require a certain maturity of neural structure or even muscular structure, before their appearance could be manifested. If such is the case, then the original three native instincts listed by Watson might well be extended to include others, appearing later in the postnatal life of the child. With this as a criterion, the problem of separating those reaction patterns which are "instinctive" from those which are "learned," "conditioned" or "habit" patterns, becomes an almost impossible task.

McDougall (115) offers as his criterion of an instinct that it should be "a primary motive," a "native spring of action," a primacy of striving, seeking, and not, as Watson claims, simply an

\* From Köhler, W. *Gestalt psychology*. Liveright, 1929.



"unlearned" connection. McDougall heads the group, known for their point of view as "purposive," or "hormic" psychologists. Here purposivism does not mean conscious foresight, but rather a study of the motivation of human behavior and conduct. In other words this problem involves (1) the solution of how far behavior reactions are native and how far they are acquired; and (2) how far "native impulses" are primary motives in determining behavior.

McDougall holds that an instinct is not only a "native spring of action," not simply an unlearned stimulus-response connection but that it has other well marked characteristics: An instinct is predisposed (a) to notice stimuli which would arouse it; (b) to make appropriate response movements to such stimuli; and (c) each instinct is colored by its accompanying emotion.

McDougall (115) offers as his list of instincts the following (pp. 135-65):

Major Instincts and Their Accompanying Emotions

Parental—protective and tender feeling

Combat—anger

Curiosity—questioning attitude

Food seeking—appetite

(Repulsion—disgust—avoidance)

Escape—fear

Gregarious—loneliness

Primitive passive sympathy—shared feelings

(Self-assertion—superiority)

(Submission—humility)

Mating—sex feeling

Acquisitive—possessiveful

Constructive—feeling of creativeness

"Appeal"—distress, "in need"

Laughter—amusement

Minor Instincts

"Sensation reflex"—sneeze, cough, scratch, defecate, urinate, *etc.*

Special attention is paid to the major instincts because it is held that it is the major instincts which account for the social activities, and in such instinctive urges is to be found the chief motivating forces underlying behavior.

Behavior is not merely a chain of reflexes touched off by chance stimuli, as the behaviorists would hold. It is more organized, and while to some extent it is spontaneous and responsive to environmental stimuli, it is also to some extent independent of them. Response may persist after the stimulus has disappeared; it may vary in its reactions as the need for adaptation becomes manifest;

it is subject to the law of trial and error, in that repetition of the situation leads to the elimination of useless movements and the retention of worth-while ones. Thus, although "goal seeking" is the objective, "learning" is not ruled out. The instinct may be inherited, but its expression in action is highly modifiable through experience. The infant who strikes out with his arms and legs is no less angry than the adult who responds by a curt remark; the emotional "core" is present in both cases.

As the child grows up, his instincts—originally separate tendencies—become attached to persons, objects, situations, attitudes, points of view, "sentiments." McDougall has analyzed many of our complex adult sentiments into their probable instinctive roots. For example, the "self-regarding sentiment" is made up of the instinct of "self-assertion," the will-to-power and the instinct of "self-submission," the recognition of superiority in others, thus creating a "balance" in the individual's attitude toward the self, and his place "in the sun."

It is these sentiments, which are founded on loves, hates, rivalries, enthusiasms, negation, *etc.*—all highly charged emotionally—which determine adult reactions for better or for worse. Our social behavior is not as rationally motivated as we would have it be. Civilization has changed a great deal since time began, but human nature is still much the same as it always was.

Woodworth (175) points out that succeeding social psychologists and sociologists, notably Wallas (167), Tead (158), Parker (126), *etc.*, while recognizing that instincts may be at the basis of our social institutions, noted also that instincts may be held accountable for some of our maladaptations. Mechanized industry tends to inhibit self-assertion; delayed marriage thwarts sex; city life precludes physical activity; large scale production deadens individual creativeness; modern society balks natural expression and leads to restlessness and neuroticism. The effect of socialization on original human nature is treated also in our section on sociological viewpoints (pp. 409 ff.). For a broader discussion of this matter, the reader is referred to Woodworth's able analysis (175).

A logical, rather than a psychological analysis of the understanding of the normally adjusted personality is offered by Folsom (36, p. 192). He considers the influence of three factors in making for normal adjustment, namely: (1) Nervous constitution (genetic); (2) degree of strain (environmental); and (3) kind of training (environmental). In terms of these bases he seeks to discover the essential difference between the unstable, psychopathic,

neurotic, or psychoneurotic personality and the normally stable person. It is a matter of common knowledge that some people emerge from suffering without permanent personality changes; some actually improve under the strain; while others become warped, twisted, and mentally abnormal in their attitudes. Omitting from further discussion those mental diseases based on organic defect, involving destruction or deterioration or toxic condition of the central nervous system (*e.g.*, general paresis, alcoholic psychoses, senile psychoses, tabes, *etc.*), interest centers around the "functional disorders" which elsewhere (36, pp. 165 f.) Folsom traces to prolonged suffering. Such disorder is usually specific and is manifested in a system of bad habits and attitudes.

These disorders are sometimes attributed to (1) a constitutional inferiority, which involves some underlying inborn chemical or physical condition of the nervous system, bodily organs, or possibly glandular secretions, which almost compel the individual to bend, break, or bear up under the emotional load. The threshold for suffering may be low in some individuals of sensitive nervous systems, and high in others; that is, the same degree of objective stimulus will be highly variable, subjectively. Folsom points out that the chief objection to such a "constitutional theory" is that the individual neurotic's suffering seems to be more tied up with particular situations, and "does not show itself in a well distributed manner throughout behavior." Also, that the abnormal behavior response is often not biologically damaging (as would be the case for alcoholism, seizures of indigestion, self-flagellation) but rather that it is socially detrimental (as in concentrating hate, suspicion, and fear on others). These neurotics do not injure themselves, but they are very annoying to their fellows.

(2) The *degree of strain* under which the individual has lived is sometimes considered as the chief causal factor in bringing about instability. This theory presupposes no variability of ability to meet the strain in terms of nervous constitution, but would hold that breakdown is in direct relation to the amount and intensity of frustration and suffering. Folsom, however, cites Riggs' (140) work as evidence against this theory; only twenty-six per cent of a group of psycho-neurotic cases showed any drastic social-environmental change preceding breakdown.

(3) The third theory to explain emotional maladjustment brings us back to the "conditioning" of the behaviorist. Here, adjustment is directly proportional to one's previously acquired organization of habits and attitudes. Bad habits, whether kinetic or ideational,



tend to become cumulative and lead to trouble and a sense of inferiority, which brings in its train, a new organization of rationalizations and unsuitable compensations: daydreams, paranoic (suspicious) trends, stubborn fixations, aversions, phobias. Even people of good intelligence are not able to reason themselves out of these mechanisms. "Some one conditioned response is powerfully out of proportion to other counteracting stimuli."

The stable person, the "normally adjusted" person on the other hand, has learned to recondition himself adequately. Tensions and frustrations attached to a particular wish are substituted, sublimated, and redirected. Sometimes the wish is given up; the situation is redefined in terms which make it more acceptable to the individual who has to endure it; religion or philosophic outlook helps one "not to care," and in such ways tension is reduced and suffering relieved, and stability achieved. The continuation of such habits of adjustment insures permanence of stability.

F. H. Allport (4) while allowing that the "physiological basis of personality traits lies wholly in the individual," stresses that many of his characteristic reactions can be evoked only through his social environment.

"A man's self-assertion, submission, quickness of temper, suspicion, pride and inferiority, are all dependent upon the existence of other human beings towards whom these attitudes may be displayed. His refinement, tact, and morality could not have come into existence without social instruction and control. The hermit exhibits little personality, except in the sphere of pure intelligence. The social side of his nature, while latent, as a physiological possibility, remains unexpressed because his solitary environment contains no stimuli adequate for evoking it. With the exception of a few traits, personality may be defined as the individual's characteristic reactions to social stimuli, and the quality of his adaptation to the social features of his environment." (p. 101) \*

In outlining the physical basis of personality, Allport includes (4):

". . . qualities of nervous tissue underlying intelligence physiological characteristics as exemplified by speed of function in nerve and muscle, levels of visceral and glandular response, and finally such simple anatomical aspects as stature, beauty, deformity, and the like. While some of these qualities may be influenced by environmental conditions (use, accident, disease, *etc.*), they are for the most part

\* This, and the following quotations from Allport, F. H. *Social psychology*, 1923, have been reproduced by permission of, and by arrangement with the publishers, Houghton Mifflin.

ascribable directly to the native constitution of the individual and the laws of growth." (pp. 101-2)

The intimate connection between the individual adjusting to his environment and his *system of habits* is reflected in personality for each particular individual.

"Level of native capacity may determine whether one shall learn a profession or a skilled trade. Visceral factors may direct a lifelong interest in art or other emotional pursuits. Special bodily defects frequently give rise to strong habit trends in the direction of overcoming them or compensating in other ways. Height and strength may contribute decisively to traits of leadership while submissive habits commonly attend an inferior physique. Unconsciously Nature affirms in each personality her adaptive principle of making the most of what the organism has." (p. 102)

Schematically Allport outlines the two-fold contribution as follows:

TABLE 83  
FOUNDATION OF PERSONALITY \*

Physical Basis in the Organism	Resulting Behavior Traits
I. Native Endowment	
a. Capacities (cortical factors plasticity of nervous system)	Intellectual Activities Skill in Special Activities
b. Physiological Characteristics	Traits of Movement
<i>Somatic</i> (speed of reaction, threshold of action, coördination)	Traits of Emotion and Mood
<i>Visceral</i> (autonomic threshold, visceral tonus, glandular activities)	
c. Morphological Characteristics (size, weight, and proportions of body, texture of hair and skin, beauty, ugliness, strength, defect, deformity, etc.)	(See under Habit Systems)
II. Acquisition	Drives and Trends of Habit
d. Habit Systems	Reactions toward Self and Others Compensations and Provisions for Peculiarities of Endowment (capacity, age, speed, energy, defect, etc.) Socialization and Character

\* From Allport, 4, p. 100.

Traits for F. H. Allport become "characteristic reactions based upon native constitution and systems of habit" in the struggle for adaptation to environment. Theoretically he groups human traits into five categories: Intelligence, mobility, temperament, self-expression, and sociality.

Allport discusses each of these fields of expression in turn, and

interesting though it is, we shall not expand his point of view here, which is admittedly theoretical. In fact the point of view of nearly all the social psychologists, and perhaps the root of their controversial viewpoints is the speculative nature of their approach. It is for this reason of especial value to turn to Murphys' "Experimental Social Psychology" (123), which attempts to gather within one volume of over 700 pages the chief research findings in the field of experimental social psychology. Obviously, even limiting ourselves to the discussion on personality as treated by the Murphys, we cannot sum up results of studies, but we can present the emergent viewpoint of the authors who undertook to survey them.

"The general biological viewpoint is worth keeping in mind. Human beings differ constitutionally, and these constitutional differences are analogous to, if not in many cases identical with, the kinds of individual differences found throughout all living things. People are not all born alike. . . . The very structure of human nature presents infinite gradations and an almost infinite variety of combinations. In addition to all these constitutional factors, there are a multitude of individual differences in which *constitutional* factors can be separated from those *socially produced* only with the greatest difficulty." (p. 558)

Later, after two chapters devoted to analysis of research studies bearing on personality make-up:

"If men were like molecules, we could hope for a science of social psychology based on the same sweeping generalizations, the same scorn for personal peculiarities which the physical sciences show.\* In the very midst of every psychological generalization, however, comes the question of individual differences; and in social psychology,

\* In this connection, the present writer cannot refrain from setting down a similar cry from the physicist (32):

"Laboratory workers know how difficult it is to get phenomena to repeat themselves even approximately, *i.e.*, within the range that we call the limit of probable error, and they will readily subscribe to the statement in Chwolson's great international textbook, that when we study physical phenomena more closely, we can convince ourselves that there is almost no physical law which can be exactly verified.

"... the simplicity of Newtonian laws may be the result of averaging large numbers of very complicated phenomena, in accordance with the well-known fact that the larger the number of cases considered, the simpler the expression of the prevailing type. Spectrum analysis and other evidence as to the structure of matter suggest that an atom of sodium may have a structure as complicated as that of a piano or stove, and the variation in the behavior of the atom may consequently be as great as that of these somewhat capricious objects. But when we remember that the number of atoms in a pin-head is greater than that of all the human beings now alive, we can readily understand why any tangible piece of sodium behaves so like any other piece. . . . In physics, as in social science, we never have the entire identical situation repeating itself." (pp. 222-3) †

† From Cohen, M. R. *Reason and nature*. Harcourt Brace, 1931.



more so than in the psychology of the isolated individual. The laws of social psychology are, in fact, in part laws as to the *relative influences* of causes—laws which pertain to the very nature of the individual differences which appear. If biology, psychology, and sociology achieve such exactness that individual differences among men can themselves be stated in terms of universally valid laws, so that the *reason for every difference is in terms of a general principle*, we shall breathe a sigh of relief at the simplification which our science will undergo. Until such laws have been established, it will be well to regard every problem in human social conduct as in part a problem in 'the laws of human nature' and in part a problem in analysis of the peculiar qualities of individual persons." (p. 688) \*

#### iv. *Personality from the Standpoint of the Sociologist*

Following close on the heels of the social psychologists in their emphasis on interaction with environmental (social and physical) forces, is the sociologist proper, whose point of approach, along with the anthropologist's, is essentially the significance of social and culture features in molding individuals. We shall here briefly outline his viewpoint:

Biologically the individual may have preceded the social group; but now, the social group receives and dominates the individual. In the words of the poet Gilbert (as referred to by Murphy (25)):

"Every boy and every gal  
That's born into this world alive,  
Is either a little liberal  
Or else a little conservative." (p. 31)

Or, to state it more psychologically, to every person there is bequeathed a social as well as a biological inheritance: His beliefs, his customs, his manners, his speech, his actions, must all conform to the dictates of his immediate culture. It is this environmental pressure and not "native" instincts which constrains men to behave alike. The environment also supplies the stimuli to reacting. Man's native instincts, the anthropologist and sociologist hold, are small, "elementary" acts, decidedly "unmeaningful," biological and primitive, and not at all the meaningful, comprehensive responses, called instincts by psychologists. (See McDougall's list, p. 403.)

The sociologist insists that the instincts of the psychologist are *learned activities*—artificial in the extreme, built up through the impact of centuries of experience on the plasticity of the individual. Bernard (23) holds that civilized man is artificially organized, and is constantly becoming more so, even to the extent of having his

\* From Murphy, G. and L. B. *Experimental social psychology*. Harpers, 1931.

native impulses largely suppressed. Under the constraint of civilized society, he selects objects to react toward, other than would be dictated solely by his own native instincts, if they were allowed free expression. The process is begun in the cradle by a sublimating mother, taking her cue from the child specialist. To quote (23):

"Civilization is itself in large part a system of sublimations and repressions. We do not give our pugnacious, sexual, gustatory, fear, and gregarious impulses free rein. On the contrary, we build up innumerable controls over them in order that we may not destroy the fabric of culture by a 'return to nature' through a blind following of our impulses. . . . Thus environment rather than instinct now shapes our behavior in the main. Environment even utilizes instinct in the service of its own collective mechanisms and values or ideals." (pp. 138-39) \*

### Physical Environment

The sociologist maintains that if instincts were as rigid and dominating as the instinct psychologists hold, there would be much greater uniformity among human individuals, as much perhaps as among bees and ants, in spite of wide differences in environmental factors, diversities of climate, temperature, soil, topography, natural resources, *etc.* But in truth, the range and flexibility of human life, in itself, attests to a variety of adjustment to physical differences. Economic organization, moral standards, political and governmental procedures vary from age to age and place to place; but within any one time and place the mass of men are alike in their conformity to the current controls.

Giddings (52) points out that the physical environment is significant only as it takes account of mental factors which accompany it; these, in turn, are dependent upon still another variable—that of geographic accessibility. Giddings identifies four general kinds of physical environment: (1) Poor and isolated, (2) poor and accessible, (3) rich and isolated, (4) rich and accessible.

In the first type, the people are usually simple and homogenous; in the second, also genetically homogenous, but suffering from a drainage by selective emigration away; the third, also a genetic aggregation, but in time the population, becoming dense, forces periodic migration away. The fourth attracts people of all kinds from all parts of the world, and soon expresses itself in inequalities of development, such as the dominating and the subordinate, *etc.*

Thus it may be seen that whatever the effects of geographic features of the environment, its influences are indirect rather than direct. Geographical set-up limits and stimulates man's endeavor;

\* From Bernard, L. L. *Instinct, a study in social psychology*. Holt, 1924.

and in carrying out its injunctions man's personality becomes shaped. Of direct psychological effects, the kind of which the poets sing, the aesthetic reactions and appreciations to mountain, stream, and tree, there is no material evidence. Art, from the hand of man, has not always been correlative with beauty, the gift of God.

Very little space will be devoted here to the theories which might be expanded at length on the effects of certain physical influences (climatological, geographic, *etc.*) on racial temperament; since in this chapter our discussion is confined primarily to those forces which make for individual rather than for group differences in temperament. However, since it is conceivable that what can "mold" a people can also "mold" a person, a few of these theories will be presented. In larger measure the discussion could be made to include the influence of climate, geographic location, natural resources, incidence of two or more cultures within one area, and so on. See Ripley (144), Boas (26), Huntington (63-a, 64), Hellpach (60), Dexter (33), Ishii (66).

In regard to their influence on the nervous system of such things as humidity, barometric pressure, and temperature, we refer to the observations of Hann (56), who noted that certain physiological effects followed higher barometric pressure and damp air. These included nervous depression, quiet sleep, increased elimination of carbon dioxide, and slower blood circulation. With the incidence of dry air and lower barometric pressure, the effects were quite opposite, including nervous excitement, sleeplessness, quickened pulse, drier skin, and lower temperature.

Changes in temperature are effective in relation to accompanying changes in humidity. High humidity makes a slight cooling very noticeable; with low humidity great changes in temperature may be borne with comfort. Hence people in dry areas, deserts and so on, may endure changes in temperature which would be very deleterious in damper regions.

It is conceivable that individual tolerance to climatic conditions may vary; that the threshold of endurance, for example, may not be the same for all individuals at any time or place, or for one individual in different times and places; that some temperaments may find one combination of factors ideal, which may be not at all optimal for other temperaments. To some extent this may be linked with physiological conditions, with cutaneous hypersensitivity, or allergy conditions. The preliminary work in the study of oxygen consumption and personality reactions is suggestive, if unestablished. (116)



### Natural Resources

Thomas (160) sums up opinions of many geographers, ancient and modern, in regard to the influence of natural resources:

"Earlier theories are simple: A fertile soil effeminates a people, and barrenness makes them brave; or the character of the food consumed has a direct effect on the character of the population. Later theories are more involved and deal with less direct effects, *e.g.*, a rich or poor environment affects man and society indirectly by limiting the size of the population and thus determining its composition and general character. In fact with the evolution of environmental doctrines, less and less attention is given to the simple and direct effects of natural resources and more and more to those which are indirect." (p. 120) \*

Thomas refers to the work of Guyot (54) who voices the views that in polar and frigid regions man has to struggle so desperately for mere existence that he has little or no time for further progress; in tropical regions with abundance of wealth, food, and comfort, at his command, man learns relaxation, leisure and indulgence too easily—leaving his tendencies to work, strive, learn, and develop relatively uncultivated. In temperate climates, alternating between seasons of plenty and want, man struggles and relaxes, works and enjoys the fruit of his labor, progressing all the while. These zones are the most ideal.

As stated before, only the merest indication of the views on the influence of climate on personality are set down here, largely because the studies represent studies of mass differences rather than individual differences. Reasoning by analogy of the application of these theories to groups to their effects on individuals is a suggestive, if highly precarious line of attack. One is instantly reminded of personal experiences in changing temperatures, of its effects on the personalities of one's friends, of characters in literature, history, and adventure who have been exiled from home, willy-nilly; but such biographical and literary reports, however interesting and impressive, can hardly be included here.

### C. THE POSITION OF MODERN PSYCHIATRY

#### *i. Historical Background*

Psychiatry is defined by Potter (131) as being "concerned with those problems of maladjustment of the total personality which arise out of the interrelationship of the individual and his environ-

\* From Thomas, F. *The environmental basis of society*. Century, 1925.

ment." (p. 4) "When psychiatry concerns itself with the study and application in the field of prevention of what it has learned from psycho-pathology, it is known as mental hygiene." (p. 5)

Modern psychiatry has been stimulated and nourished from several academic and clinical roots: (1) Descriptive psychology which allowed for both physio-genic and psycho-genic causation of aberrant mental behavior. (2) Freudianism and other psycho-analytical schools which stress the purely psycho-genic. (3) Physiological psychology, both from the standpoint of the pathologist studying degenerative brain tissue, and the experimental psychologist interested in the neural basis of normal motor and mental reactions. (4) Behaviorism, the outgrowth of a combined physiological and psychological viewpoint. (5) "Psychiatric social work" or the direct study of the environment and social forces—community and family backgrounds—working on the individual. (6) Mental Hygiene, both as a movement and as a force in setting up Child Guidance Clinics, in which thousands of careful case studies have accumulated. (7) Pediatrics and "Child psychology," both of which obtain material from many of the above sources, and more recently from intensive study of infants and very young children in the laboratory nursery school. These approaches have led to a pronounced interest in and recognition of the "individual" rather than the "type." (8) Endocrinology, or the control of constitutional deficiencies (leading to personality disorders and treatment by glandular therapy). (9) Anthropology and study of the social cultural milieu in which standards of behavior, conventions, *etc.*, are determined.

Modern psychiatry may be said to have begun when the medical profession freed itself of a religious and metaphysical explanation and interpretation of insanity. Since the middle of the nineteenth century and about the time when Darwin published his *Origin of Species*, psychiatry began to respond to science. The wrath of God, the importunities of witches, demons and devils, and other equally mystical agents, ceased to be considered or offered as explanations of psychic disorders. About this time, also, clinics and hospitals became centers for observing and recording symptoms of mental disease. This, in turn, led to a more orderly and objective description and classification of mental diseases than had heretofore prevailed, and which in the scholarly hands of Kraepelin (1856-1926) achieved its highest culmination. Kraepelin's system (93) which distinguished about twenty main categories of insanity is still followed, with some modification, by present-day psychiatry.

It is recognized, however, that mental diseases are not independent entities; that gradations and transitional types are found between the categories which in the last analysis are merely to be regarded from the standpoint of convenience. Some captions, indeed, such as *dementia praecox*, are held to cover several different kinds of mental disorders.

Research on the central nervous system, beginning about 1850, together with later microscopic studies of brain deterioration, added greatly to a better medical understanding of the relation between degenerated tissue and various mental diseases, especially those of old age, such as senile psychosis. Toxic conditions in the body, which directly and indirectly influence the central nervous system, traumatic injuries, brain tumors, and other organic conditions of disease, malformation, or arrested development, were studied in relation to so-called organic psychoses, such as some of the epilepsies, paralyzes, *etc.* More recently the glands of internal secretion have captured the attention of medico-physiologists. The abnormal functioning of ductless glands is now being studied in relation to personality and "abnormal" behavior.

The middle of the nineteenth century was also characterized by the rise and development of "experimental psychology," by Wundt, Fechner, and others. These laboratory workers studied normal reflex reactions in terms of neural mechanisms. Disturbances in neural functions were held accountable for abnormal behavior. Here, from the early 1900's on, as in the clinic, "physiological psychology" received pronounced support from Pavlov. Pavlov's experimentation on conditioned reflexes became classic: Meat is brought to a hungry dog while a bell is ringing; the dog's response to the sight of food is to secrete saliva; later the bell alone is rung and the dog is observed to salivate just as though the meat were presented. Obviously this direct connection is established without the intervention of thought. In such a manner some of our deepest and (apparently inexplicable) complicated neurotic behavior can be explained. Some extreme emotional crisis, such as bereavement, fright, or other experience, has been associated with some irrelevant and unnoted stimulus. Later the stimulus, unaccompanied by the disturbing situation is in itself enough to set off the emotional reaction.

Morton Prince has illustrated by citing the case of the girl who was thrown into severe mental agony at the sound of church bells. Unable to explain this condition, she sought psychiatric help. Careful study of her history uncovered the fact that during the



operation and death of her mother, the church bells had rung. At the time she had scarcely heeded them. Later they alone were sufficient to reawaken a worry and dread equivalent to that which she had felt over her mother.

Pavlov's "conditioned reflex" conception has thus been enlarged to include a whole integrated series of reflexes, an emotional response of glands, muscles, and mental reactions.

H. L. Hollingworth (62) has incorporated the same conception in a somewhat more comprehensive explanation of the etiology of a neurosis. His "redintegrative mechanism" whereby a part of an experience serves to reinstate a previous whole, is a more enlightening concept, not only to neuro-psychiatry, but to the psychology of personality in general.

This "conditioned response," or redintegrative explanation, is more comprehensive than the previous paragraphs would suggest. Its reoccurrence is not dependent upon one instance of severe conditioning; the response may be set up as a result of repeated and relatively untuned emotional conditioning. Day after day, a child is given food and the word "milk" is spoken; week after week, he asks for food and the word "please" is demanded; month after month, his physical needs are cared for, now with enthusiasm, now with silence, each according to social and conventional requirements. In time the baby grows into a speaking individual, a courteous individual, a tactful individual, or a "spoiled child," depending as he has been conditioned in the thousands of combinations possible to a growing human being. This explanation of the variations of normal as well as abnormal personality leads directly into "Behaviorism." Watson, the behaviorist, however, would do away with conscious intervention entirely, reasoning that the conditioning takes place in the glands and muscles. He would center his attention on physiological reactions—glandular secretions, disturbances in the function of the sympathetic nervous system, and the like; these alone are sufficient explanation for a later neurosis. (See p. 388) Treatment consists in "reconditioning" on a better muscular-glandular basis. Watson has no place for "ideas," "consciousness," the "subconscious," or any other concept which invokes more than a biologic basis plus a social conditioning.

Although psychiatric treatment of mental disorder by psychic methods is as old as mental disease itself, the recognition of the psycho-genic factor in producing such disorder and a true understanding and use of mental treatment are very recent. The understanding of mental problems in general, and even of normal

personality expressions on the emotional side, may be said to have begun with the study of neuroses by Charcot (1825-1893). He it was who recognized that a morbid idea could produce hysteria; that the mind could be "split" into dissociated states; that certain deeds or thoughts could be affected "unconsciously." But Charcot at no time was willing to renounce the organic basis, usually as conceived by him a "hereditary organic degeneracy of the brain," as fundamental to the set-up of hysteria. Bernheim of Nancy offered a more purely psychologic explanation for hypnoidal or suggestive states as basic to hysteria. Further intensive studies and contributions to a descriptive psychology of split personalities have come from Janet (70) in France, and Morton Prince (134) in America.

Freud (born 1856), who began his career as a student in Charcot's clinic, and who later collaborated with Breuer of Vienna, initiated the first purely psychological approach to an understanding and treatment of mental behavior. Freud's emphasis on "conflict of wishes" with its resulting repressions, sublimations, substitutions, and compensations, is the cornerstone of modern "dynamic psychiatry." The disruption to personality set up as a result of the struggle of repressed wishes to find outlet will be discussed later (pp. 418 ff.). It is referred to here because as a contributor to modern eclectic psychiatry, Freud cannot be overlooked.

Modern psychiatry owes much to two of its outstanding members, Bleuler and Meyer, who, while not actually discarding psychoanalytical concepts, who, by accepting and criticizing the formulations of Freud, have maintained a balanced and independent attitude toward them. Bleuler at the same time has stressed the significance of psycho-dynamics in behavior and has evolved concepts of his own such as autistic thinking, ambivalence (ideas charged with opposite affects), schizoid and syntonik personalities. Adolph Meyer, dean of psychiatry in America, also represents a blending of the old and the new approaches in psychiatry. Principles of a dynamic psychology not necessarily Freudian are adhered to by many psychiatrists, who, however, also adopt the contributions made by the psychologist, the social worker, the endocrinologist, the pediatrician, and other specialized examiners of the patient.

The viewpoints of the various "psychologies" have been presented earlier in this chapter; so also that of endocrinology (pp. 368 ff.) which very recently has been ably reviewed by Hoskins (63). The enormous contributions of social work, especially of that specialty known as "psychiatric social work," will be indicated in

a later discussion of the activities of Child Guidance Clinics, whose technique is based primarily on a thorough investigation of the background of the patient. In a broader way it is becoming more and more recognized that the cultural milieu in general can determine the nature if not the extent of personality maladjustments. The recent writings of such anthropologists as Mead (117), Fortune (37) and Benedict (20) show how the conflict or lack of conflict is tied up with the general cultural patterns, conventions, restraints, and demands of the milieu. Levy (103, 104) has drawn the attention of the psychiatric profession to the clinical value of such anthropological material.

Whatever the concepts invoked, conservative or extremist, whether Watsonian or Freudian, social, medical, or psychological, psychiatrists are forced to recognize that a large part of adult maladjustment is to be traced to early childhood. In their attempt to explain behavior, therefore, the psychiatrists have gone directly to the child in the clinic, the school, the home, the nursery. The intensive study of childhood has proceeded along experimental and therapeutic lines. In the clinic and the court are to be found problem children and juvenile delinquents, while the home and the school offer material on "normal" reactions, itself embracing a wide range of individual differences. The nursery school, less than ten years old, offers the nearest approach to a control situation in which growth and adjustment can be studied in an orderly and experimental manner.

To obtain an adequate understanding of the total personality of an individual, the psychiatrist concerns himself with (1) psychological equipment, emotion, drives, intelligence, (2) physical equipment—systematic and pathologic—and, (3) social experience, including both past and present methods of reacting to environment. Psyche, soma, and environment, these three—not as separate entities—but as one, interacting and indivisible, mold personality for modern psychiatry.

## *ii. Psychoanalytic Viewpoints*

Theories of the dynamics of behavior—motivation and adjustment—discussed by the social psychologist or sociologist in terms of instincts, urges, drives, mental mechanisms, wish frustrations, rationalizations, compensations, and the like, lead us straightway into the field of the psychoanalyst. The views of three leaders of the psychoanalytical group are presented here, not because these can be held to fall within the scope of academic psychology, but



because they have contributed some useful concepts to the study of personality, as well as some highly suggestive lines of attack which can be followed by experimental psychologists in exploring human personality and uncovering its basic factors. In a small way such research has already begun. (30, 35) It is to be hoped that further controlled experimental work will accrue as time goes on.

As it is now the theories of the psychoanalytic group are based largely on the principles set down by Freud, together with impressions of each individual analyst; impressions, it is true, gathered from observations on many separate patients, and therefore highly valuable. But, unfortunately, the case study at its best lacks merit as a scientific technique in gathering research data. (See page 105) It lends itself too much to the slant or point of view of the interviewer; it is apt to allow too many possible variables in each case to escape unobserved and unquestioned. The chief criticism leveled against the psychoanalyst is that he approaches his case with certain arbitrarily, rather than scientifically, set up preconceptions with which as a framework he interprets the case.

#### Personality according to Freudian Psychoanalysis:

Freud's basic point of approach is in explaining all neuroses as a result of repressed infantile sexuality; which repression, indeed, is held to be a factor in the life of all people, neurotic or not. Other Freudian assumptions are primarily: The unconscious; polarity and dualism, (a) of the ego and the libido, (b) of the ego and the "id," (c) of the ego and the "super-ego," or "ego-ideal"; and, in addition, Freud has identified certain mechanisms of adjustment, which the individual develops in his struggle between the poles of any dualistic pull. These "mechanisms" will be discussed a little later. (pp. 420 ff.)

Briefly, the Freudian's concept of the "unconscious" includes the recognition of certain guiding principles. For example, what is forbidden, feared, or a matter of solicitude, must be deeply desired. Such wishes, especially in early childhood, must be repressed. They are strongly "emotionally toned"; this emotional energy is also repressed and compacted into the subconscious, where it is held in tension—powerful, but unrecognized by the particular individual harboring it. Many of these wishes are directly contrary to our social taboos, especially desires connected with sex. In its most immature expression, Freud maintains that sexual gratification is realized in such forms as: "Sucking (at the breast), thumb-sucking,

finger biting, petting, stroking, and rhythmic movements of the limbs; eliminating the bowels and bladder; showing off; destroying things, and other forms of spontaneous play." These the infant is taught to avoid or, in some cases, to conceal from social observation. The various stages of psycho-sexual development, the Freudian keystone of personality, are discussed on pp. 423 ff.

*Pleasure-reality Principle.* The "pleasure principle" of conforming to the demands of nature, calling for immediate gratification of desire, clashes with the "reality principle," and leads the individual to take refuge in daydreams, where unconsciously he obtains gratification. In this way the individual takes over unto himself some of the environment to hold the pleasure impulse in check.

*Eros-death.* Another instance of dualism is the contrast, set up by Eros (the instinct of self-preservation plus the instinct for self-reproduction) and Death, working together and against each other. The death wish is identified in the longing for rest or Nervana, and in certain destructive and cruel acts, such as sadism and suicide.

*Ego-Id.* The struggle of the ego, which is partly conscious, partly unconscious; which consciously, in turn, is partly in touch with the outside world, and partly with its own inner life, is directed against a disturbing unconscious Psyche, an "it" or an "id" down inside the unconscious—the "soul" of the repressed and censored desires and experiences of the individual. Thus the ego, being a part of the "id" as well as of the environment, is subject to both forces and has characteristics of both. The well adjusted personality is weaker in the "id" than in the "ego" portion.

In addition, Freud posits a "super-ego" or "ego-ideal" (identified as conscience), the direct result of a prolonged childhood and delayed libido expression. An example of maladjustment arising from struggle within this dualism is the well known, oft referred to "Oedipus Complex," in which the libido (for a male child) becomes "attached" to the mother, and the "ideal" to the father, who at the same time is the hated rival—again something which must be renounced.

*Mechanisms of Adjustment.* In connection with the early sexual impulses of the child which are prevented by environmental considerations from attaining free expression, certain substitute reactions are developed which serve as an outlet in greater or less degree, adequately and imperfectly, for the energy tension thus set up. The psychic interplay of the Id, Ego, and Super-ego, in

their efforts to conform on the one hand to the gratification of original and organic nature and on the other to meet the demands of society, is a continued story of over-excitation, frustration, motor-discharge, and evasion. While the Id demands gratification the Ego demands harmony and unity. Where the Ego cannot remain an ally of the Id, it employs various forms of defense against its discharge of Id energy. These defense mechanisms are active, dynamic, and subtle in character, and operate usually on an unconscious level. They are present to some extent in all of us; their extreme manifestation, however, is a characteristic which classifies an individual as unbalanced, unstable, abnormal or insane. Development, whether normal or neurotic, is a compromise between the fears, hesitations, and control of the Ego, and the urges and excitations of the Id.

The specific mental mechanisms for draining off the tension—known also as “dynamisms”—are many. Healy, *et al.* (59) list seventeen by name. Here we shall discuss only a few of those most commonly recognized: symbolization, repression, projection, conversion, sublimation, rationalization, dream-work.

*Symbolization.* The process of symbolization is completely unconscious and is used to gratify some strong wish, which is incapable of fulfillment on the conscious level of adjustment. To circumvent this inhibition a symbol is employed to represent the desired object. Because of the excessive amount of taboos on sex strivings, these symbols are often phallic. All symbols represent primitive ideas and interests. Jones (72) holds that: “. . . all symbols represent ideas of the self and the immediate blood relatives, or of the phenomena of birth, love and death.” (p. 170)

The symbol is built up through association of one object with another object, of the part with the whole, or one of some quality or characteristic which the symbol and the object of desire have in common. Freudian literature on dreams is rich in symbolization, many of which, to the lay mind, are extremely far-fetched. In his excellent analysis of symbolism, Jones (72) mentions by way of illustration, that a room may symbolize a woman, or her womb; the serpent is the male phallus; a plain gold ring, complete surrender of the female. (p. 195 f.) True symbolization is remarkable for its universality among different peoples, and in different periods of time, in different fields of ideation, such as dreams, poetry, wit, insanity, *etc.*, thus denoting a characteristic uniformity of the human mind which lends to the concept a greater plausibility.

*Repression.* A powerful defense technique utilized by the Ego



is that of repression, *i.e.*, the forcing out from consciousness and overt activity, of distressing and unpleasant ideas and feelings.

"The conscious Ego may repress into the unconscious Ego, or if the thrust is strong enough into the Id, and the unconscious Ego may repress into the Id." (59, p. 221)

Repressions take place mainly in childhood and if at a later age, only in regard to the "primordial repressions" of infancy. The sum total of repressing forces make up the "censor,"\* operating at the dividing line between conscious and unconscious, and relieving the conscious mind of the burden of carrying a host of unpleasant and socially dangerous conflicts. These complexes, buried alive in the unconscious, do not rest there dormant and inactive, however, but stand ready to break through in disguised form or substitute-gratification. They may express themselves as fear, anxiety, giggling, "nervousness" of some sort.

Repression is a term which can be applied to that condition in which the ideational memory of highly charged incident is lost, but the emotional effect (*e.g.*, anger, grief, shame) retained; opposed to this state of affairs is the more normal retention of the facts of the incident with a distinct toning down and usually (after lapse of time) a complete loss of the emotional aspect originally aroused.

*Projection.* Projection is one of the first tension escapes employed by the child. It is a tendency, common to all of us, to refer or project our own unpleasant sensations or emotions to an external object or person. Its extreme expression is to be found in the paranoiac. The young child who, falling, strikes a chair, blames the chair; the workman who spoils his handiwork, blames his tools; the inadequate individual, socially unrecognized, is convinced that society is persecuting him. The paranoiac has constant delusions of persecution.

Projection is a form of self-justification (under control of pleasure principle) which relieves the Ego of much pain.

*Conversion.* Conversion also represents the struggle between the instinctive and repressed impulses and the defenses set up against them, in this case representing an unsuccessful repression. This dynamism, commonly met with in hysteria, makes use of a physical reaction for the release of emotional tension. Hysterical symptoms are held by Freud to be disturbances of sexual development. Genital impulses are displaced to indifferent parts of the body and there manifested as a tremor, a paralysis, a headache.

\* The concept "censor" has been largely discarded in recent Freudian literature.

When use is made of an abnormal somatic reaction, already established on an organic basis, *e.g.*, asthma, the form is known as "fixation" hysteria.

The result is of course not always successful, for although abolishing psychic pain from consciousness, it leaves in its train many disagreeable bodily symptoms which in themselves can be a decided handicap in life.

*Sublimation.* Sublimation is the substitution of infantile sexual impulses for interests, pleasurable but no longer sexual, and socially on a higher plane. This exchange is of course performed unconsciously. It is a healthy and desirable way of release. The channels open to the sublimative process are limited in number; hence the sublimations shown by many people (like symbolizations) tend to be alike. Commonest perhaps is the choice of a certain profession as an opportunity for release or expression of some primitive striving: The woman deprived or bereft of children takes up social work; the infantile tendency to self-display may result in the choice of a fame-seeking occupation—(actor, orator, writer, *etc.*); primitive desire to play in the dirt may later be sublimated into painting, sculpture, or manipulation of some other malleable medium, as in cooking.

*Rationalization.* Rationalization, or disguised reasoning, is the method adopted to justify to ourselves our undesirable thoughts or behavior. It is seen in one form in projection (already discussed). It is essentially an attempt to explain (by revising the situation) so that one is blind to all but the evidence which will cause the Ego to appear in a good light.

In an attempt to keep up with the Jones, a neighbor will buy an expensive radio; when taken to task, or indeed without this intervention, he will be ready with the statement that his nerves absolutely need the soothing effect of music at night, for without such rest he cannot work at all, and would then be unable to support any expense whatsoever.

*Dream-work.* Because of the absence of intellectual operations, dreams are very often illogical and absurd in their sequences and meaning to the conscious mind. In dreams it is the dynamisms rather than straightforward mental processes which operate, producing this apparently ludicrous effect. Even in dreams the Ego and the Id must compromise; there is still very much resistance to the natural expression of an unconscious impulse. Dreams have a double content: the "manifest," revealed to the dreamer; and the "latent," revealed to the psychoanalyst who is qualified to catch the true meaning by probing under the distortions and symbolizations

related by the dreamer. Because in sleep the inhibitions are somewhat lower than in the waking state, much of the submerged emotional life of the individual is expressed in dreams. Psychoanalysts hold that the dream is one of their most powerful means for penetrating the unconscious and thereby understanding the roots of individual personality.

Psychoanalysis is, then, interested in studying backgrounds, and through them, in interpreting the significance of specific behavior patterns. It has reached its study by close observation of the psycho-biological development of individuals in their cultural setting; it regards as normal that personality which succeeds (socially) "in overcoming the more primitive type of mental structure." (59, p. 310) The adjustment made in each childhood to the demands of libidinal (psycho-sexual) impulses sets the main traits of character permanently.

### Psychosexual Development

More recently Freudians have been laying great stress on the psychosexual development of the individual as the core of his later behavior adjustment or maladjustment. The young infant is primarily and almost wholly occupied with elementary life processes or "id impulses," such as sleeping, sucking, eliminating. He obtains his "erotic" satisfactions on three areas of his body—the oral (mouth, lips, gums, teeth), the anal (through expulsion and retention of feces and urine), and the genital (through masturbation). The "libido" or energy which urges these innate and primitive drives into expression during the earliest years is allowed almost free scope. Later release of these primitive tensions is prohibited by training in sphincter and bladder control, weaning and regularity of meal hours, genital taboos, *etc.*, and the child is made conscious of a force outside of himself to which he must conform.

This regulation by environment makes him differentiate between himself and his surroundings. His "ego" or a self-consciousness develops in relation to others. He becomes aware of himself as resisting. Later his tensions become switched from his well defined somatic areas to psychic levels. He can no longer obtain physical satisfaction at will, and in the process of his training he develops repressions, inhibitions, and controls. Out of this conflict with customs and taboos, there develops his "super ego" or conscience which can be relied upon to control his somatic urges when, at a later date, they become reinforced in intensity by puberty. During this "latency period" between infancy and puberty, commencing at about eight years, his development is largely on a social plane,



although the earlier ego-centric, physical desires are not completely submerged. The person most responsible for the socializing process is the mother, and to her is transferred the pent up libido which can no longer obtain relief through auto-erotic satisfaction. Thus the mother becomes the first love-object.

Later, in the pubertal period, the child transfers not only his reawakened physical libido, but also its "sublimations" or socialized expressions to some one outside the family, and hetero-sexual interests and relations are entered into. This striving to go beyond the family is often opposed by parents and new conflicts are then set up.

Frustration of development at any level leads to maladjustment; *e.g.*, if the child in the "latency period" is not able to win his mother's attention while submitting to new restrictions, he is apt to develop conduct disorders which compel punishment, over-anxiety, *etc.*, but at any rate, attention, from the mother. Lax habit training in the earlier years may encourage fixation at the oral or anal levels, and habits of untidiness, stubbornness, acquisitiveness become permanent traits. Mother fixation in the latency period may render impossible a later transference to a heterosexual love-object. Juvenile delinquency, neuroses, psychoses, and various forms of maladjustment are the direct result of an improperly developed libido.

The psychoanalyst distinguishes three main characters of libidinal development corresponding to the oral, the anal, and the genital. Gratification at the oral (sucking) stage leads to an optimistic outlook on life, to a care-free attitude, to generosity, even to dependence and inactivity, as a result of easy and early nourishment from a bounteous mother. Disappointment at the nursing level may result in later impatience, apprehension, pessimism. The anal character, according to Freud, embodies the three personality qualities of over-accentuated orderliness and conscientiousness; of parsimony; of obstinacy. Since the first genital desire is for the parent (Oedipus complex), failure at this level interferes with development of social adaptation in general. Successful transference of Oedipus wishes marks success in all later object relationships, individual and social.

These "developmental beginnings" merge into habitual behavior patterns, recognized in many personality formations. How the Ego with the help of the Super-Ego tames or controls these "asocial strivings" by inhibiting and sublimating, determines the ultimate personality.

*Summary.* It is almost impossible to collapse Freudian psychology into a ten page exposition; but perhaps enough has been said to indicate that Freud's explanation of neuroses (and of lesser maladjustment) is that they are due to the individual's unconscious efforts to harmonize his own desires with the social conditions around him. He is not, as the behaviorist would have it, impressionable tissue under impact of a set of conditioning stimuli, but an opposing, expressive, resisting individual, who must attempt to meet all the counter demands made on him. That he often achieves his adjustment on an unconscious level, is no refutation of his response to a struggle. Indeed, his later readjustment is almost entirely the result of his own doing, under the guidance of the physician, who by psychoanalysis, causes the patient to relive the earlier experiences which were wracked with discord and emotional conflict. This memory, emotional rather than mental, is re-experienced, and transferred to the physician or other appropriate individual. At this mature, adult, and conscious level, it can be subsequently taken care of, in a harmonious way, and therapy for the patient is established.

Freud's point of view in regard to the severely neurotic may hold true for all people, since everybody has some maladjustment in some degree. His frank recognition of the rôle of sex in bringing about nervous instability, has done much to establish a more reasonable attitude toward sex life and sex "problems." His concepts of mental mechanisms, especially his "defense mechanisms," have proved very useful to the scientific psychologist in observing and recording human behavior, and in initiating a program of research calculated to test them out.

Psychoanalysis itself, while not true in any absolute sense, while not inductive in its consideration of future material, while often extremely bizarre and ludicrous in its symbolism, can yet be considered a definite contribution toward a better understanding of personality.

#### Personality According to Adler's "Individual Psychology"

The psychoanalytic school, initiated by Freud, soon expanded and separated into several lines. That chief emphasis should be laid on infantile sexuality as motivation in behavior met with opposition from one of Freud's earlier disciples, Adler. To the latter it seemed that the fundamental factor in neuroses was a feeling of inferiority—physical, social or intellectual; which, bringing in its wake frustration in realizing a fundamental urge, namely, *the will to power*

(to dominate others), leads the individual to compensate for this feeling in various ways, resulting in maladjustment, misconduct, or achievement.

Actually it may not be the *fact*, but the *feeling* of inferiority which drives the individual on to greater incentive. The feeling of inferiority may not correspond to one's chief defects, but more to a weakness which occurs in a field one *cares* about: For example, if physical perfection and beauty is the chief goal, then a certain intellectual weakness may cause no discomfort. To the social climber, inferior physique may be no cause for unhappiness, except perhaps in so far as a physical defective is frustrated in attaining social distinction. The intellectual aspirant may care very little about blue books and social registers; the administrator, anxious to wield power over others and to dominate their activities in subservience to him, will undervalue intellectual achievements, artistic expression, or any other output not within his own range of activity.

Physical defects cause feelings of inferiority. This inadequacy is concealed or capitalized by over-development along the lines of weakness. Adler (2, p. 79) points out that left-handed people, taking to the arts, develop extreme dexterity as instrumentalists and painters. Milton and Homer, though blind, Beethoven, though deaf, and Demosthenes, an early stutterer, all excelled in their respective fields of handicap.

Equally interesting is the mental mechanism that marked inferiority in one field of human activity, which cannot be overcome, is compensated for by a drive in another field. The individual born with organic inferiority, handicapped by an unlovely body, may be impelled to achieve along some line in which he recognizes his ability. The well directed efforts of Napoleon, Steinmetz, Roosevelt, and others, attest this. The lowly born child sharpens his native wit in proportion to his native social inferiority: Lincoln, and perhaps half of the American intellectuals and "big business men" of the present generation, born "on the farm," in the "small town," the "slums," the "log cabin," *etc.*, since the days of "equal opportunity for all," and now recorded in *Who's Who*, afford illustrations.

When the wish to power, to superiority, is frustrated, the individual may be driven to die; or to "pretend" a success which he does not have, or to invent excuses, to "make arrangements with himself," to adopt a style of life or behavior pattern that enables him to avoid the pointing finger of an environment stronger than he. "If I were not so ill, so poor, so busy, so handicapped by



circumstances, I could do thus and so," he tells himself, and thereby becomes appeased in his own eyes at least; and to some extent in the eyes of his friends whom he succeeds in convincing. Even some highly successful men who have compensated for initial inferiority by high grade achievement, never quite overcome their earlier inferiority feelings.

Adler holds that the "style of life" adopted in earlier years remains rather fixed as one's permanent life pattern. As the individual matures and approaches his three main problems of living—finding companions, finding a job, finding a mate—he reacts in the way typical of his early childhood. The "spoiled child"—usually the only child, or the youngest child in the family—continues demanding that he be the center of attention and service; the eldest child is conservative and bossy; the second child or succeeding children constantly seek to surpass; the "hated" child tries to escape; the child of a very successful man feels it is impossible to outdo his father's attainment, even to reach it, and makes no serious efforts.

Thus one by one Adler sketches "typical" modes of behavior developed within the family circle. His stress on position in family is his own contribution, his insistence on the significance of earliest years on formation of personality types, he holds in common with the psychoanalytical school in general. As to sex, he writes:

"Sexual components cannot even be correctly estimated except in relation to the individual's style of life. The erotic phases are functions of this individual life-style, and we can gain insight into the erotic life with all its waywardness, hesitation and elusive subtleties, only so far as we grasp the individual's style in the prototype. By the prototype I mean the original form of an individual's adaptation to life. The psychic prototype is a finished being by the time the child is four years old." (p. 93) \*

The child's first approach to life's problem's *e.g.*, acquiring friends, predicts the way he will proceed to acquire a job and a mate. He may meet these problems courageously, with self-assurance, or with anxiety, and in a competitive spirit.

The main advice which Adler has to offer, therefore, is that the young child should be assisted to master his own problems. The child accustomed to love and understanding, prepared always to meet approval and pleasantness on the part of his associates, faces the world with a trust and self-confidence quite unknown and undeveloped in the youngster who has met with teasing, bossing, thwarting of his natural inclinations, threats to his feeling of

\* From Adler, A., *The problems of neurosis*. Farrar & Rinehart, Inc., 1930. Reprinted by permission of publishers.

security and well-being, and punishment. The former type becomes socially a good mixer, the latter withdraws into seclusion, shyness or fear; or if the anger emotion is strong, becomes defiant, sullen, quarrelsome; if self-assertion is strong, he defies society and becomes delinquent. Different emotions are paramount in different individuals; but emotion of some kind is the motivating force in all major reaction. Whether native or acquired, or both, it is important that the direction of the initial jets be controlled and fostered to be of greatest value to the individual in the matter of social adaptation and personal self-expression.

#### Personality according to Jung's "Analytical Psychology"

Another division, or off-shoot from the Freudian school, was initiated by Jung. Jung's contribution is not so much in instituting new concepts as in extending and delimiting those of Freud, under whose tutelage he began his psychoanalytic career. Division in theory and outlook between these two men resulted in a professional break; strictly speaking, Jung, like Adler, is disowned by the psychoanalytical school, and relegated to a new group, satisfied to be known as "analytical psychologists."

Jung differs from the Freudians, chiefly in that he postulates a libido, or urge to life, as the motive force in activity. This libido is more inclusive than Freud's sexuality, and Jung is articulate in recognizing within it affects other than those which spring from sexual drives—affects arising from artistic, religious, and aesthetic drives.

Jung extends the unconscious, posited by Freud, to include not only the suppressed personal experiences and images, but universal experiences, "primordial images," which are inherited *in toto*, as "patterns of thought." These primordial images are strikingly like Freud's symbolizations in that they are found among all peoples, primitive and modern; in that they recur, when free from restraint, unpolluted in dreams and phantasy. By studying mythology, anthropology, and primitive religion, Jung feels he has narrowed down the patterns which man has evolved racially in his attempts at *learning* to think and reason. Symbols represent substitutions of the abstract for the concrete, of the image for the precept, of the retained impressions for the active response to stimulus. Hence the unconscious of man is a reservoir of these retained racial patterns as well as of the individual's submerged personal thoughts and feelings.

Jung posits that his "collective unconscious" reflects more than

the animal-like badness of the race; it also manifests an obvious tendency on the part of humanity to strive toward the good, the high, and the sublime. This pull against anti-moral urges, he holds, is something inherent *within* the Psyche, and not imposed from without (although Christianity was instrumental in hastening its crystallization). It is analogous to Freud's Super-ego. It is responsible for a tension between the spiritual and the physical in man, between what is sexual and what is anti-sexual. Religion, actively felt and expressed in one's life, constitutes an excellent means of sublimating or draining off this tension; and on religion and metaphysics depends much of Jung's therapy in restoring sick personality.

Religion, however, is also potent to send to the unconscious ideas which are not in harmony with the good life. Hence for every idea in the conscious there is a corresponding antithesis or opposite in the unconscious. The unconscious may then also hold what is supplementary or compensatory to the conscious. These elements accumulate and increase tension. For Freud's mechanism of suppression, Jung substitutes by introducing a concept from physics of "increase and decrease of energy tensions." He also allows that conscious, as well as unconscious, affects may lead to complexes which result in neurosis and hysteria. In this he goes much beyond Freud.

Jung's chief contribution, however, is his position with regard to conscious mind, of which he holds there are two fundamental manifestations: (a) Through emotional tension; (b) through contemplation. These two aspects of expression are doubtless to be found in all people; but in every person one trend is dominant over the other. This tendency to be more of one type than the other is revealed in Jung's analysis of personality types into the *extrovert*, who expresses himself through his feelings and bodily action, and the *introvert*, who expresses himself through reflection and bodily inaction. The extrovert is aggressive, interested in other people, gives vent to his social interests, and seems less interested in himself. The introvert, on the other hand, is slow, deliberate in his actions, inclined to daydream, to keep to himself, shunning company and revelations of his thoughts, and is rich in "inner life." Obviously very few individuals are extreme examples of either of these two types, many falling midway between, and having symptoms of both. It is very difficult for the two types to understand each other, and this fundamental difference in equipment and approach to life situations accounts for much of the tension between individuals.



Four mental processes—thought, feeling, sensation, intuition—are common to any Psyche, however. Each of the above four may be directed extro- or introvertly, and this in itself accounts for further variation in personality.

Although Jung lays much more emphasis on present conflicts than do Freud or Adler, and although he warns that reference to the remote past may draw attention away from the irritating present, he also recognizes in the unconscious life of the child “a state of complete fusion with surrounding conditions”—that the “Psyche of early infancy is to a large degree a part of the maternal Psyche,” later of the “paternal Psyche” also. Friction between parents is a fundamental cause for nervous behavior or misconduct in the child. The child’s infantile behavior in meeting these situations is apt to characterize his reactions to the strains of adult life, situations which he cannot meet successfully, which demand a sudden new adaptation, will draw from him—if he fails—a regression into the earlier habits of meeting difficulties in the family life which characterized his infancy. If his problem disappears his infantile behavior disappears. And again, when under great stress, the mind can revert to the simpler, easier, primitive forms and patterns, which characterized the infantile race.

#### Personality According to the Neo-Freudian or “The New Psychology”

The above brief exposition of the three directions which psychoanalysis has taken represents currents of thoughts which have accumulated volume and force as time has gone by. Freud’s emphasis on repressed sex desires, Adler’s insistence on the will to power, Jung’s concept of two fundamental types of reaction (intro- and extroversion), are all helpful in thinking about human personality and its expression. There are many psychoanalysts who do not adhere to any of the above schools, who incorporate into their philosophy elements from all; who are disciples of Freud in technique rather than in theory; there are other psychiatrists who subscribe Freudian concepts but evolve their own methods of therapy, but more and more are psychiatrists coming to recognize the psychological aspects of neuroses and psychoses,—that is, the psychogenic as distinct from somato-genic.

The “Neo-Freudians” are not disciples of Freud, nor are they organized into one group. The “new psychology,” to which they, in varying degrees, adhere, undoubtedly received its impetus from Freudian literature, but was initially guided through its labyrinths

of mythology, symbolism, unsupported assumptions, extravagant deductions, and far-fetched interpretations, sense and nonsense, by British common-sense and Anglo-Saxon logic, headed by Rivers (145). Salvaging certain parts of the Freudian doctrine, rejecting others, critical and progressive, but not yet developed to a school of highly organized principles and practices, the "new psychology" may be said, in the words of Jastrow, to embody the following point of view (71):

"The Neo-Freudian position accepts the doctrine that psychic factors play a leading part in the formation of functional nervous disorders; that they operate in some measure subconsciously; that they center about conflict situations, typically a conflict between strong instinctive trends, and the restraints imposed by socially acquired controls; that the instinctive trends thus operative include the self-protective, the sexual, the social, and their many derivatives and interactions; that complexes are an expression of such conflict between instinctive drives and their frustration or imposed control, or between derivative issues related to them; that the manifestations of such conflict tendencies, and of the mechanisms by which they come to expression, appear in dreams, in character traits, and in many varieties and patterns of human behavior; that this recognition can be assimilated with established knowledge of psychic operations.

"They recognize the validity of many of the mechanisms that appear in the course of the analysis by which normal and neurotic expressions may be accounted for; such as rationalization, compensation, projection, sublimation, substitution, symbolism; they recognize that by the inclusion of subconscious operations, by the principles of fantasy and reality thinking, by the detection of the hidden motive, by the emphasis upon the motivation factor, including some measure of determinism, a large range of human behavior is illuminated.

"They take into account the significance of the early stages in the direction of destructive trends and the habit formations by which their control is established, recognizing likewise the peculiar importance of the intimate personal contacts within the family relations, and that the entire life circle is set in a progressive direction, whose normal course is beset with the liabilities of arrested development and regression. They are prepared to apply these principles constructively and correctively to the educational process in all its bearings, to focus the efforts upon the wholesome integration of personality, and to develop the social milieu to the proper satisfaction of normal urges and the provisions for the attainment of the sublimated expression thus indicated." (p. 117) \*

The great significance of *initial* organization of ideational, emotional, and kinetic reactions, an organization which accumulates and persists into adulthood, making for adjustment and maladjustment,

\* From Jastrow, J. *The house that Freud built*. Greenberg, 1932.

is a keynote of all branches of psychoanalysis as well as of behaviorism. Otherwise the two schools are as far apart as the poles of any controversy can be: Psychoanalysis personifies the subconscious, the cistern or receptacle of our habit and attitude reactions; behaviorism vegetizes it, reduces to biological terms all psychological phenomena. The neo-Freudian psychiatrists, friendly to Freudian theories, with variations, are more than ready to accept the tremendous significance of environmental influences both in causation and treatment of sick personality.

### *iii. Other Conceptions of Mental Disease*

#### The Physiogenic

In direct contradistinction to the psychogenic point of view, outlined for the psychoanalyst, will be presented an opposing view, lately made very articulate by Moss and Hunt (128); the view that regardless of pattern organization of mental habits, a physical basis must always be sought in all cases of maladjustment or mental disease. Chief among the organic causes of mental disorders, are the following: Bacterial infection, toxic poisoning; glandular disturbances; deficiency in cell nutrients and in cellular tissue itself; deterioration of cells; mechanical injury to nervous tissue; and temperature disturbances. Contributing factors to mental disorders are to be recognized in age, sex, some occupations, and emotional crises which are accompanied by organic changes.

Bacterial infection can attack the brain or spinal cord directly, as in syphilis; or indirectly, by carrying toxins through the blood stream from focal centers within the somatic areas. Exogenous toxins, such as alcohol or opiates, and endogenous toxins arising from auto-intoxication, can set up mental disturbances. The glandular disturbances of exophthalmic goitre, myxedema, acromegaly, *etc.*, produce chemical changes which can destabilize the nervous system. Recent work on dementia praecox suggests its dependence upon inadequate oxygen and vitamin intake. When cellular tissue is missing, either as a result of natal deficiency, destruction by accident or disease, or deterioration of old age, nervous and mental disorders are concomitants. The delirium of fever, the unconsciousness of sunstroke, the "mental desuetude" of the resident in the tropics, all attest the force of extreme temperature influences on mental balance and control.

Age, and sex, accompanied by physiological change (puberty, menopause, senility) may contribute to derangement. Certain occu-



pations supply an opportunity to acquire drugs, drinks, or poisonous gases, which may lead to bad habit formation or breakdown.

It is not our purpose here to enter into any extended discussion of the etiology of mental disease; but obviously it would not be fair to leave the reader with an impression of this very unsettled matter through the presentation of an extremist point of view which insists on an underlying physical pathology. True enough, toward the end of their book, Moss and Hunt discuss paranoia, hysteria, and psychasthenia as a group of "mental disorders the causes of which are unknown," and epilepsy, dementia praecox, manic-depressive psychoses, and neurasthenia as "mental disorders the causes of which are only partly known"; but in doing so they maintain that inability to find a physical cause is no criterion for placing emphasis on psychogenic factors, that is, for interpreting the disorder as being due to the results of bad thinking, suppressed desires, and emotional conflicts. These conditions are not held as disease entities in themselves, but rather as symptoms of different diseases.

#### Hereditary, Congenital, Environmental Influences

To acquaint the reader with the general present-day trend of psychiatric interpretation of mental disease, summary quotations are included from more representative English and American points of view. Campbell (28), an outstanding American psychiatrist formerly of Johns Hopkins and now of the Boston Psychopathic Hospital, stresses the emotional factors involved in mental disorders which cannot be explained by brain trauma, infections or drug effects or nutritive disturbances, and the like. He draws attention to the phases which man as a race has experienced in evolution from primitive to present cultures; to the residual attitudes, feelings and expressions which each individual has left over from infancy and childhood. Imagination, phantasy, temper outbursts, superstitions, will often break through a none too well developed behavior pattern of adult self-control and logical judgment.

"Situations cannot be faced, memories cannot be longer borne, feelings become intolerable, obscure emotional tension reaches the breaking-point; then clear, rational, mature adaptation is given up, the individual becomes blind to things as they are, wipes out memories, hands over the reins to more primitive tendencies of the personality, and sees the world peopled with hostile forces, or flattering allies; odd symbolism takes the place of objective thought; the real and the ideal, the subjective and objective become hopelessly intermingled." (p. 48) \*

\* From Campbell, C. M., *A present-day conception of mental disorders*. Harvard Univ. Press, 1924.

Among factors operating to produce mental disorder, Campbell mentions disordered chemistry of the system, organic weaknesses, poor physical hygiene, stress of life situations, early training and experiences and blunders, with their distorted beliefs and blind gropings. "Mental disorders can be explained in the light of the same general principles which explain the working of our bodily organs, the evolution of the instincts, the origin of human culture, and the early phases of individual development in infancy and childhood." (p. 50)

We quote next from an English source, the textbook prepared by Henderson and Gillespie (61):

"A mental disorder is the sum of many conditions, and the end result of a long chain of processes. The earliest of these may have begun in the unfertilized germ-plasm, another may have operated *in utero*, and the rest may be reactions of an organism thus handicapped to the aids and obstacles which it subsequently meets in the environment in which it finds itself—the influence of parents and teachers, the difficulties in the path of ambition, and the ease as well as the hardness of innumerable situations in life. The first of these factors falls in the usual scheme, under "heredity"; the second under "congenital," and the next under the headings of age, sex, family, *etc.* But it is the ensemble of all such factors that is the "cause." An examination of our case records shows that there is never in a given case one single aetiological factor, but always a constellation of them. Moreover, the cause is not a bolt from the blue, nor a mysterious entity, destined to implant itself at a certain epoch on unprepared soil; the "cause" is a process—something that moves and shapes itself in the passage of time." (p. 26) \*

The above expression of opinion on the part of English alienists is not unlike the prevailing interpretation represented in the following quotation by J. V. May (112) recently President of the American Psychiatric Association:

"Similar heredity is said to be the general rule in manic-depressive psychoses, epilepsy, and alcoholism, and to a less extent in arteriosclerosis. Heredity, in so far as it is related to mental disease, may be said to be largely a question of the transmission of a neuropathic or psychopathic constitution or predisposition. Various psychoses are now held to be the direct result of constitutional causes or hereditary influences. This is probably true of manic-depressive insanity, Huntington's chorea, involution melancholia, dementia praecox, paranoia and paranoid conditions, epileptic psychoses, the psychoneuroses and neuroses, psychopathic personality and mental deficiency. It is true that some of

\* From Henderson, D. K. and Gillespie, R. D. *A text book of psychiatry*. Oxford Univ. Press, 1930.

these conditions develop as the immediate results of certain predisposing factors, and that in frequent instances no evidences of heredity can be found. It is also true that various authorities maintain that a predisposition to the development of certain psychoses may be acquired." (p. 150) \*

Hereditary influences (based on recent statistical studies), J. V. May finds, account for from fifty-five to sixty per cent of the cases admitted to our institutions.

"In conclusion, it may be said that the important etiological factors in the production of mental diseases are heredity, senility, syphilis, arteriosclerosis, somatic diseases, mental deficiency, epilepsy, diseases of the brain and nervous system, alcoholism, drugs, traumatism and mental stress and shocks of various kinds. It is hardly necessary to add that our information on this subject is far from complete." (p. 154) \*

Many investigations have been undertaken into the hereditary nature of mental diseases. Such investigations usually involve the tracing of the appearance of insanity, "nervousness," or extreme personality deviations in the family line. At best this method is incomplete and inconclusive. People, even enlightened and educated people, are still dominated by the attitude of insanity as a stigma and for that reason, if for no other, are prone to hide its incidence wherever possible. Even where coöperation and truthful revelations are voluntary, the ability to reveal is often limited. People know so little about their forebears, especially about those beyond the third generation. Again the position of psychiatry two or three generations ago renders the diagnoses of the earlier periods somewhat dubious. Many individuals who (were they living today) would be brought to the attention of a psychiatrist, were tolerated by their families as having been "queer," or simply a nuisance, or perhaps even "blessed." Then, too, many who did not break down in the relatively quiet culture of an earlier day could not have met the strain of our present mechanical speed had they been exposed to it. Provocations of today will induce a psychosis which would not have been induced in a slower moving milieu.

At best then, the investigation of the heredity of mental and nervous disorders and personality instabilities will have to take a forward rather than a backward direction. Records of people living today should be correlated with full personality records of their descendants rather than with the incomplete data of their antecedents; and what is even more important, *all* descendants should

\* From May, J. V. *Mental diseases*. Badger, 1922.



be included in the study. Interlocking factors, such as the direct effect of contact between neurotic parents *living with* their children will have to be allowed for; the rôle of glandular constitution in heredity will be a tangible unit for study; the type of environmental strain precipitating breakdown will be recognized, and human heredity will be studied with almost the precision of an experimental set-up.

Less susceptible to experimental control is the actual origin of mental disease. For this we are more or less dependent upon the experiments which nature and nurture together evolve in the process of an individual's existence. But we can sharpen our observations of such experiments, and from this knowledge illuminate our future procedures with regard to the mentally ill, the mentally maimed and thwarted; and to educational industrial and social policies in general. This point of view, namely, that of prevention, is the basis of a movement which began twenty-five years ago, known as Mental Hygiene.

#### *iv. Mental Hygiene and Prevention*

Mental Hygiene as a movement was founded in 1908 by Beers (19) a former patient, who on recovering his sanity, set out to improve the conditions in mental hospitals. Beginning in the State of Connecticut, committees for mental hygiene are now scattered all over the world, which broad compass was attested to in 1930, in an international congress. The Proceedings (137) of this first congress review the history, organization, and principles of mental hygiene.

The objective of mental hygiene is mental health and happiness for mankind, through the recognition of individual personality, the development of individual abilities, through the cultivation of favorable environmental influences and the avoidance of injurious stimuli. The program of the society entails prevention of mental disorders by every prophylactic method known to medicine and the social sciences, including education. The extent to which prevention becomes effected through eugenic selection is just beginning to be articulated in a mental hygiene program. (Rudin, 137) One feels that a changing economic order will demand more attention here.

The efforts of mental hygiene workers, at first directed toward improving conditions for the insane through an educational campaign against public ignorance regarding insanity, were later definitely organized to prevent mental breakdowns by training teachers, social workers, parents, and the laity in general in early recognition

of symptoms and prevention by cutting off the factors at their sources.

These earlier concepts of psychotherapy and prevention have now been enlarged to include a philosophy of life. The "good life" is one that is not just negatively good in being free from complaint but positively good in self-realization, in living at one's best. To master the art of living, man will be spurred on to learn more and more about himself, as much or even more than he has already learned about the world in which he lives. The values of life stressed by mental hygiene and progressive education are character, social well-being, self-expression, or the attainment of one's great possibilities, and the like.

Mental hygiene objectives imply a full knowledge of favorable factors in growth and development of wholesome personality. The intensive case studies accumulated in Child Guidance Clinics within the last two decades have added enormously to a better psychiatric understanding of the significance of childhood as the keystone. It is everywhere recognized that treatment and training are more effective if applied early than when applied late.

As we noted on pages 382 f, it is only within the last decade that psychology (through the nursery schools) has made the orderly observation of factors behind early mental and emotional growth, its direct concern. In the preschool laboratory the growing child is now observed by specialists; then, too, conditions are set up in the maternity hospital, the nursery at home, the nursery school, the day school; all these are studied in relation to their effect on personality. The environment is measured, analyzed, and correlated with tangible observations on child behavior, and origins of behavior are thus sifted out. The child as a whole, as an integrated personality, is studied by the pediatrician, the nutritionist, the social worker, the teacher, the trained nurse, the trained mother, and the psychologist. Their combined knowledge and findings are fast becoming available to the psychiatrist, who himself is often on the staff of a child development center.

With his increased wisdom regarding the influences which operate to produce adjusted personalities, as well as his accumulated and extensive knowledge of factors which lead to maladjustment, the psychiatrist is doubly equipped to contribute to human happiness. And with G. Stanley Hall (55) a pioneer of the psychology of childhood, we are made more and more aware that "success in life is far more dependent than we realize on a happy childhood."

*Delinquent and Problem Children*

A psychiatry which dealt with maladjustment soon found itself handling case material which could not be included in the category of "mental diseases," which term largely implies irresponsibility. Problem children are obviously maladjusted, but by no means, or necessarily, "irresponsible." Psychologically, there is little ground for inferring a general factor which would be common to problem children, nor do delinquents in any psychological sense constitute a "type" group, but, rather are they children who exhibit an "undesired" reaction—maladjustment admittedly—conflict within the home, the school, the community. The degree of delinquent aberration depends on the elevation of standard violated. The seriousness of misconduct is in proportion to the social control in which the child has been fenced. The nature of his act may vary from refusing to eat, from contradicting a companion, to breaking and entering, grand larceny, or murder.

Similarly, the diagnosis of "problem child" is valid according to the experience and perspective of the person making the judgment. Even skilled judges cannot base their opinion on a written case record alone, as was interestingly shown (132) when records of behavior were taken from notes made on normal (although at times mischievous) children in the home, the classroom, the playground, and other media, where children live and move and have their ups and downs.\*

The attempt to depict average behavior in a statistical picture is obviously difficult, variation and complexity being, here, as elsewhere, a function of group expression. The attempt to rate behavior as "problem behavior," or to call a child a "problem child," cannot be divorced from the "situation." Murphy (121-a) points out that it is illogical to try to set an arbitrary line between delinquency as an aberrant entity and normal behavior as a "control." Behavior, whether viewed as a sum total of all one's conduct, or as a multi-form expression of hundreds of separate traits, thousands of separate, distinct acts, is a continuum, a gradation, and not an

\* Of forty-five social histories of third grade children, all within one school, sent to fifteen scattered Child Guidance Clinics, with the request that an opinion be given as to whether the child described in each report was in need of psychiatric service, returns came in for thirty-nine. Of these, seventeen children, or thirty-seven per cent, were considered as positively in need of clinical attention, or, in other words, were looked upon as "problem children." Yet none of these children was considered as problems by their teachers, who knew them in relation to one another as members of a third grade group. Obviously behavior of these "normal" children, as reviewed by the clinics, had simply acquired significance because it was viewed against an artificial background; because, also clinical workers are highly "sensitized" to symptoms of maladjustment, be they ever so minor. (132)



all-or-none affair. For the individual it is a growth, a development; for the group, it is heterogeneous in proportion to the fineness and discriminativeness of the measurement. Each record of delinquency is an individual affair. And if among the group of "delinquents" (*i.e.*, children who have been referred to court) is found a high percentage of subnormal mentality, a smaller percentage who are temperamentally unstable, a high percentage who have known only poverty, it is but a reflection of the fact that the handicap has added to the struggle to adjust, not that it, in itself, must lead to delinquency. The day is fast going when we talk of a "criminal type." Many juvenile delinquents would doubtless, if unrestrained, unguided, and unprotected, develop into adult criminals, but many will at the same time, if placed in a favorable medium, deviate back toward conformity.

An exposition of the psychological point of view in regard to delinquent personality should almost begin with Healy, for he has been the pioneer contributor to our knowledge and understanding of factors basic to "misconduct." Healy leans neither in the direction of the constitutionalist, nor of the environmentalist, but taking a middle-of-the-road position holds himself open-minded toward contributions from all students in the field. Turning to his recent summary (58) of theories of delinquency which have at different times been advocated, we find discussions of the following:

(1) (Social): Poverty, including wretched homes, vicious associates, usually from the "dregs of society"; often, too, conflicts between standards of the home group and the interests and desires of a larger social group. (2) (Biological): Theories of physical abnormalities and stigmata, including atavistic and degenerate types; arrested mental development; hereditary defects; feeble-minded or psychopathic personality. (3) (Psychoanalytic): Mental mechanisms in operation; that is, the mind works according to certain patterns, seeking to express instincts, to substitute for them. This approach holds repressions, impulses, ideas, as causative to misconduct. (4) (Socio-psychological): The situation as a whole, the interaction between individual and environment, in which the environment plays on the person while he in turn modifies the environment. This is the conception of "circular response," acceptable in the fields of biology, the social and political sciences, as well as in psychology. (p. 39)

In this connection, Healy pertinently remarks:

"What is apparently the same environment means very different things for different persons, partly on account of innate differences

between individuals, but also partly because of previous experiences that have formed mental associations and mind-set." (p. 43)

The reader is here reminded of the point of view expressed by Gestalt psychology, particularly by Lewin, on the essential one-ness of "experiencing individual in relation to situation." (See p. 396 f.)

### Child Guidance:

The study of behavior in relation to the stimulus situation has become the dominating principle of the various "Institutes of Child Guidance" in this country within the last five years, and an understanding of the total personality as a genetic outgrowth has become their direct concern. How experience of any sort can be "built in" to the structure of personality, however biologically "set," is reflected in the pronouncement of Lowrey (110): ". . . that the individual at any given moment is regarded as the product of all that has gone before, including not only his original constitution but the modifying influences of the development of life itself." (p. 186) The only safe method is to explore as completely as possible the individual's previous experiences, his reactions to them, to interpret not only exhibited behavior, but also his emotional conflicts and "inner sets."

The outline used at present by the Institute to study child behavior will reveal better than any descriptive account which we might render, the direct approach used in these child guidance clinics toward an "inside" understanding of the personality of the "problem child."

Outline used by Institute of Child Guidance, New York \* (110)  
(Abridged by the writer)

Give a description of the patient's behavior in the following situations:

1. In reaction to the parents: Under ordinary circumstances; in response to punishment or correction of any sort; in response to presents or pleasures provided; in response to any unpleasantness in the family, both when it affects him personally and when it does not; in response to anxiety or depression in one or the other parent; in response to nagging and scolding; in response to solicitude; in response to praise; when requests are refused; in relation to parents' special attitudes toward siblings.

2. In reaction to siblings; in play; in competitive relationships of work, school, appearance, *etc.*; to parental attitudes toward other siblings.

\* From Lowrey, L. G. In *Institute for Child Guidance Studies*. Commonwealth Fund Div. of Publ., 1931.

3. In reaction to home; toward physical make-up, comfort, *etc.*  
Comparison with others' homes.
4. In reaction to people outside the home.
  - a. With other children: at play, at school; competitive work.  
Is he a leader? Originator? Timid? Bully? *Etc.*? Give examples.
  - b. Toward adults: Are attitudes different from those shown toward parents?
5. In reaction to authority at home or elsewhere. Variations to command, persuasion, *etc.*
6. In reaction to work or duty demands: Nature of tasks, how well or poorly done, pleasure or displeasure, *etc.* Energy, consistency.
7. In reaction to his own interest in terms of: What he likes to do; how he goes about it; energy, consistency.
8. In reaction towards himself in terms of: Self-reliance, self-pity, self-blame, self-conceit, *etc.*
9. In reaction toward life in general: Acceptance of responsibility, practical trends, *etc.*; daydreaming, imagination, understanding of realities. (pp. 187 ff)

Such an analysis is calculated to produce a fairly clear cut picture of why the child is what he is. Additional material can always be included. Such factual material will relate the outer behavior to the inner emotional life, and will serve to displace the natural tendency to estimate other people's reactions in terms of the investigator's own experiences, since after all the only personality each one is intimately acquainted with is his own.

Recently a much more comprehensive outline has been published by Levy (102). This fourteen page outline (which unfortunately cannot be reproduced here) covers the psychiatric social history to be taken by the social worker who visits the home; and also the psychiatrist's examination of the child in the clinic. It includes detailed guides for observation of the child's behavior and background, as well as his ultra-psychic conflicts, and a careful perusal will repay the reader interested in research on personality.

Levy's article (to which the above outline is appended) has been written from the clinician's point of view. Using the psychiatrist's opportunities and technique to gather and study his case material, Levy has overtaken his profession's usual disregard for scientific analysis, in that he has set up a control group against which to compare his delinquents. Unfortunately for the statistically trained psychologist, eager to check up reliabilities, *etc.*, Levy does not submit quantitative data, since his report is admittedly a tentative one. It is well illustrated with individual case reports. "The study is an attempt to learn about the nature of juvenile



delinquency,\* the factors which steer a child into crime rather than into other types of behavior or personality deviation, and the methods that can best be used to prevent or offset criminal careers." (p. 74)

The social scientist cannot but be much impressed with the array of evidence brought forward by analysis of case material as offered by Levy † to suggest that delinquency is primarily environmental in origin.

Among other important causes, delinquency is chiefly related to an unsatisfactory recreational life, to an unwise and limited choice of friends, to familial social stigmata (*e.g.*, alcoholism, immorality, pauperism, criminality, *etc.*). Non-delinquent problem children (*i.e.*, those with personality difficulties) are apt to have neurotic taints in their heredity. Juvenile misbehavior of all kinds is associated with the type of discipline in the home; is characterized by neglect, erratic decisions, favoritism, jealousy, parental discord, household strife, sibling embroilments. Physical factors, constitutional biases toward certain types of behavior (*e.g.*, homosexuality), and disease sequelae (such as the marked changes in personality known to follow encephalitis) characterize delinquents. Non-delinquent problem children, however, are associated with cardiac disease, infantile paralysis, *etc.*, which diseases, accompanied by debilitation, do not permit of violent social or anti-social activity. Some delinquent careers are due to intra-psychic conflicts; some to a complete lack of such conflict. "A little inhibition is a desirable thing." Culture and race conflicts, especially between parents and children, account for some careers. Constitutional inferiority, psychopathic personality, hereditary stability or instability (even with full benefit of favorable environment) manifest themselves in anti-social behavior.

Of special interest is Levy's attempt (1) to sketch individual varieties of delinquent children, or (in medical parlance) to note "special clinical syndromes" (p. 110), and (2) to separate causes making for juvenile delinquency from causes underlying personality problems. Significant ways in which the two groups of problem children differ are summarized by Levy (102):

"(1) The non-delinquent (problem) child has frequently no friends, or at best a few companions with whom it gets along badly. Recrea-

\* Delinquency is defined by Levy as an act, such as stealing, sex activity, incorrigibility, for which the offender might be brought before a court.

† Details of Levy's findings and conclusions must be omitted here, since this chapter is limited largely to a discussion of theory and "point of view" of various schools on the development of personality.

tional interests and activities are quite often limited, when they exist at all, to one or two asocial outlets, *e.g.*, reading.

"(2) The delinquent boy or girl's friendships and play life show much more variation: (a) He may have many undesirable social contacts. (b) There may be but one very close friendship to which the partners make most unequal contributions; one leading, the other following. (Differences in age and intelligence may be important factors in establishing the closeness of this bond.) (c) The delinquent may have no friends at all. In these instances there may occur an unwholesome relationship with a chance acquaintance. (d) Recreational life bears a direct relationship to the number and type of acquaintances. The less serious type of delinquent plays with his gang on the street, helping to organize other kinds of excitement when opportunities for stealing into the movies do not present themselves. More serious delinquents engage in no play, or, at best, enjoy a selected activity (*e.g.*, shows, or trips) with but one companion." (pp. 92-3) \*

#### IV. SUMMARY AND CONCLUSIONS

We have attempted to give a brief expository account of the points of view held by the leading schools of psychology and psychiatry on the development of personality. We have presented these points of view in a more or less categorized form, trying to do so without prejudice or favor, and pointing out at times certain similarities or points of difference between the varying "schools." Doubtless an adequate understanding of personality can profit by contributions from all of them. Certainly each is experiencing a healthy growth; and while this development is progressing more or less separately, and by widely different routes and techniques, while "growing pains" are at times manifested as one or the other reaches beyond its own possibilities, all are in more or less agreement on certain points, such as: The foundation of biological equipment; the dynamism of "instincts" or "emotions" as motivating forces; the significance of biological variation; the necessity of social interaction for development; differentiation with experience; the importance of the earliest years of life in the formation of habits, attitudes, ideas, overt reactions, many of which are set even before speech is established; the consolidation of "original," "acquired," and modified responses to a point of complete metamorphosis; the importance of a two-fold emphasis in interpreting any behavior manifestation, namely, the complete personality mechanism up to date and the situation towards which it is called upon to react.

\* From Levy, J. A mental hygiene study of juvenile delinquency. *Amer. J. Psychiat.*, 1932, 12.

Personality is dynamic, not static; it is never the same twice, either for two individuals at the same time or for the one individual at different times. For that reason one hesitates to call it a structure. One hesitates also to refer to it as a mechanism, because intricate and active though it constantly is, it does not conform to the laws applicable to a machine. For that reason its working, its fluctuations, its expressions, and its inhibitions can no more be subject to a "rule of thumb" than can its energizing forces.

But because in all this vital mesh of action and reaction one is repeatedly made conscious of *some* trends which seem in *some* way to be characterized by consistency and predictability (within certain limits) one has a feeling that this "relative regularity" could be spelled out according to some general principles which would hold true for a large part of human behavior.

If we try to use any one psychological system of types and try to apply it to our friends and acquaintances, we recognize Miss A. as an excellent example of the introvert; yet when we try to classify Miss B. as to extroversion-introversion, we cannot seem to place her. Her body build, on the other hand, suggests the pyknic make-up; yet clearly she is too active, energetic, and forceful to conform to the personality concomitants of the pyknic build. Instantly, however, there flashes to mind the fact that she is almost a pure example of Spranger's "political type." Mr. C., intellectual, studious, impulsive, "loosely integrated," strong in the "will-to-power," but unable to wield it, easy mixer socially, indifferent build physically, cannot be fitted into the schemes of Jung, Kretschmer, or Spranger. But if we had insight into his genetic development, many of his behavior manifestations which seem so irrational and inexplicable to us, would be illuminated. This knowledge of earlier influences might be obtained (however imperfectly) by the method of psychoanalysis, by detailed questioning of mother, teacher, friends and associates whose memories are fallible and whose answers are subject to "halo"; or a personal interview, characterized by a high degree of *rapprochement* between Examiner and Subject, might be equally illuminating and equally limited as to value. Perhaps the most promising approach to a complete understanding of the development of personality from its first faint beginnings at birth through its impetuous growth in infancy and childhood—a growth which never actually ceases being subject to change and modification while life lasts (although for most people it seems to be more or less stabilized by about the age of thirty), is to be found in the research studies now being projected by the preschool laboratories where



infant behavior is under relatively constant and continuous observation; where close coöperation is established with the parents in observing and controlling the forces back of behavior. Highly suggestive beginnings have been made by Goodenough, Thomas, Jones, Blatz, and many others. Until experimental research extends its activities enough to set up its own "laws," the student of personality is limited to the deductions to be made from case material, speculative philosophy, and subjective report.

## RECOMMENDED READING

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- Allport, G. W., and Vernon, P. A., 1930. The field of personality. *Psychol. Bull.*, 27, 677-730. (Review of literature to 1930.)  
 Murphy, G., and Jensen, F., 1932. *Approaches to personality*. New York: Coward McCann. Pp. 427. (An analysis of points of view of various schools of psychology and psychiatry.)

### *Social Psychology:*

- Allport, F. H., 1923. *Social psychology*. Boston: Houghton, Mifflin. Pp. 453.  
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### *Child Study:*

- Writings of J. E. Anderson, W. Blatz, A. Gesell, F. Goodenough, H. E. and M. C. Jones, D. S. Thomas, M. M. Shirley, and other child research centers including the Child Study Association of America. (See also notes following Chapter I.)

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*Proceedings of First International Congress on Mental Hygiene*. New York: Internat. Comm. for Mental Hygiene. 2 Vols. Pp. 803 and 840.  
 Various text books and articles on psychiatry to be found in the writings of B. Hart, W. White, A. Meyer, E. Bleuler, E. Kahn, Bumke, and others; and for psychoanalysis the individual writings of Freud, Jung, Adler, S. E. Jelliffe, W. Stekel, A. A. Brill, etc.

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  6. *Mental Hygiene*. New York: 370 Seventh Avenue.
  7. *Psychological Clinic*. Philadelphia: Psychol. Clinic Press. (Accounts of individual case studies.)
- See also notes at end of Chapter II.

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CHAPTER VI  
CONCLUSIONS

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## I. GENERAL PURPOSE AND CONTENT OF THE BOOK

This book has begun the attempt to assemble materials now becoming available for a more scientific understanding of the interaction of heredity and environment to produce human characteristics, with particular reference to the light which this material may supply to studies in eugenics. Since no science is stronger than its instruments of measurement, a survey of measurement has been a pre-requisite. For simplicity of presentation, the field of mental characteristics has been somewhat arbitrarily divided into the two-fold categories: intellectual and temperamental (personality). Discussion of tools and techniques of measurement has been classified according to these same groupings.

The status of measurement appraised in Chapters I and II revealed findings which bear rather closely on materials reviewed in later chapters on the development of human mental characteristics. All studies reporting influences on development, mental and physical, are strong to the extent that their instruments of measurement are valid and reliable. Since many extravagant and even bizarre claims have at times been made on such topics as group differences in intelligence, influence of certain environmental factors in developing traits, *etc.*, it is essential in interpreting such data that a proper perspective be kept, *i.e.*, interpretations must be made which are based on all the inherent factors.

### A. HEREDITY AND ENVIRONMENT AS FACTORS IN DEVELOPMENT

In any analysis of the relative importance of heredity and environment, it must always be remembered that one factor cannot exist without the other. It has aptly been said that there is not, never has been, and never will be a germ plasm without an environment. Hence it follows that the development of any human characteristic or total organism is profoundly affected by environment. It is also profoundly affected by heredity. A seed will not grow without a garden, be the medium soil, water, or air.

Granted, without question, that heredity and environment (nature and nurture, stock and culture) both contribute, and that neither alone is sufficient, each being always dependent on the other,

it nevertheless remains that the functions of one can at times and in varying degrees be taken over by the other. For instance, if nature has set up determiners for a pale complexion, environment can be instrumental in darkening it. This too can be said of hair color, but not so much of eye color. If, on the other hand, environment has set limits for the development of a characteristic or organism, let us say, body weight, nature nevertheless manifests and asserts herself to produce individual differences. Children growing up in a situation of extreme malnutrition do not all attain the same limited size. Nature in some cases supplies what environment has failed to supply. In other words, weights and heights will vary.

The extent to which either heredity or environment supplement each other in the development of certain physical and psychological characteristics is a subject of great interest.

#### B. HEREDITY AND ENVIRONMENT AS DETERMINERS OF INDIVIDUAL DIFFERENCES

The extent to which heredity and environment respectively contribute influences accounting for differences among human beings is a subject of even greater interest.

Daisy seeds cannot grow into daisies without a medium. But no amount or quality of floriculture will produce red daisies out of white ones. To get this effect one must alter the materials (genes) within the seed itself, namely, the hereditary equipment.

The large variation of differences to be found among different human beings is to be attributed in part to heredity and in part to environment. The extent (a) to which heredity can determine individual differences is magnified by environment; (b) the extent to which environment can modify original differences is limited by heredity.

If a group of individuals, varying as to original equipment, is subjected to a uniform environment (no matter how restrictive or how powerful) original differences will nevertheless still appear. If such an innately different group were subjected to a widely varying environment, the original variation would be increased.

A restrictive environment reveals individual hereditary differences; a powerful environment emphasizes them, the duller individuals failing to profit from the benefits, the brighter individuals profiting in direct proportion to their degree of brightness.

When it comes to forming an estimate as to how wide a range of individual development heredity will permit for each characteristic, one must always have in mind three things: (1) the particular

characteristic; (2) the particular individual (*i.e.*, the individual degree or potential of the characteristic) and (3) the particular environment. Other interlocking variables and influencing tendencies should also be looked for.

For example, let us take John Jones, whose potential I.Q. is 180 in a perfect environment. In an average American environment it might be 140. If placed in a very superior American environment, he might, let us say, have reached 160. In a very inferior American environment he might have dropped to 120, a range for the two environments of 40 points.

If Bill Smith, on the other hand, has a maximum capacity for development up to I.Q. 95, and returns an I.Q. of 70 in an average American environment, then in the superior American environment this could probably not be established at a higher level than 80, and in an inferior environment might be set at 60, a range for the two environments of 20 points.

These two cases are hypothetical but they will serve to bring out the point that "to him that hath shall be given." The brighter will profit most from opportunity. The same degree of possible growth or decline in quantitative points cannot be assigned to all levels of intelligence. The profit depends on the producer.\*

Hence it is really not legitimate to ask: What is the relative importance of heredity and environment? This question belongs in the scrap basket with the type of general conclusions in some of the studies quoted: "It appears that heredity is twice as important as environment in determining intelligence." The new approach would be: Given a stated environment, how much variation will heredity permit for such and such a characteristic (among so and so individuals)? Or, given a stated heredity, how much variation could a given range of environment introduce for such and such a character?

One must constantly bear in mind the distinction between the influence of heredity and environment on the development of human characteristics (personality, physique, intelligence, *etc.*) and the

\*Some individuals have an idiosyncrasy to certain medicines or drugs; what affects one will have comparatively little effect on another, and may have an extreme effect on someone else. This analogy can be transferred to the understanding of certain environmental effects on mental capacity. If a low grade moron were put into a college classroom he would probably get nothing out of the professor's lecture; if placed in a moving-picture house, he might respond with interest to the horse play on the picture. If a superior adult were placed before such a picture, he might go to sleep, but in the lecture room would add to his store of knowledge. A meager environment might not affect him in a positive way, but a richer environment would affect him in a stimulating way. To the moron, an intellectually stimulating environment is no asset and a meager environment no handicap.



influence of heredity and environment in accounting for differences between individuals or between groups.

## II. DISCUSSION OF FINDINGS

### A. STATUS OF TOOLS OF MEASUREMENT

#### *i. Environment*

Obviously the new approach requires very detailed observation, measurement, and control of environment. Degrees of difference in the environmental variable should be directly correlated with degrees of difference in the human product, other variables being controlled.

Various measurements of cultural environment have already appeared (within the last five years or so); but these must undergo considerable extension and refinement before they are adequate to the needs of the research worker interested in relating differences in cultural backgrounds to differences in the physical and psychological development of individuals. All our studies are weakened by their lack of proper environmental measures.

#### *ii. Intelligence*

The measurements of general intelligence have progressed to the point where for all practical purposes in the hands of the psychologist they can be considered both valid and reliable. These measurements have not only undergone a profound improvement in their mechanics since their inception some twenty years ago but have brought to the test constructors a clearer understanding of the nature and meaning of intelligence as a psychological trait. There still remains to be investigated by the statistical psychologist the very important matter of disentangling and measuring the separate entities which integrate to make up the composite "general intelligence." To the eugenicist, the development of these "unique traits" in relation to heredity and environment may be of vastly greater promise and significance than has been research on the development of general intelligence as a unified whole.

The only direct attempts which can be made to study the effects of heredity and environment in accounting for the intelligence of the individual are those which compare the development of identical twins reared in different environments. However, investigations have been projected to study the effect of these two influences on

groups, usually by noting the power of one or the other variable to alter group averages (*e.g.*, foster children and own children). Since the affect of the variable is itself a variable from individual to individual, it is much more in order to study influence on variation within the group. Burks estimates that if the differences in foster homes were reduced to a constant, the result in variations in I.Q. would be only seventeen per cent less variance than what she actually found.

### *iii. Personality*

Intelligence can be thought of quantitatively, and as of an additive nature, so that it can be distributed among the population.\* Physical traits on the whole, and in part, can also be considered as on an additive basis. But personality traits are combinations, integrations, and so susceptible to interlocking factors, that their expression cannot be set down in additive values, much less expressed in numerical indices.

It is this interlocking of factors within the organism, of factors outside the organism, and of the relations of each factor to every other factor, that makes of personality such a mesh that each total individual of necessity constitutes a different pattern from every other individual. Hence the futility of looking for a numerical index of personality, or even of expecting to find clear-cut types among human beings! The best that can be hoped for in a search for types are certain rather generalized patterns which in some respects tally with each other; but most assuredly never in all!

This introduces a problem at present engaging the attention of biologists and psychologists, namely, that of the generality versus the specificity of growth. To some extent development proceeds both by wholes and by parts. At first a relatively undifferentiated organism, responding to maturation urges and to environmental stimulation and nourishment, grows according to a sequence which results in specific spurts. These in turn may respond to generalized environments and also to specific factors in the environment.

When this concept is applied to personality mechanisms and traits—when these latter in turn are so incapable of differentiation and identification—one can scarcely wonder at the enormity of the

\* From the quantitative point of view, traits which are unidimensional are found to be distributed among the normal population in a bell-shaped curve. This means that if all the people were distributed in a row with respect to any such trait (from those having very little to those having a great deal), there would be a very few at one end, very many in the middle range, and very few at the other end, and that no clear cut differences would appear between any two adjacent individuals. (See page 57.)

task involved in tracing the development of personality, or in accounting for the respective influences of heredity and environment to create individual differences in personality.

## B. CONCLUSIONS ON HEREDITY AND ENVIRONMENT

### *i. Intelligence and Environment*

Having in mind certain limitations which make for validity and invalidity of studies (such as adequate standardization of tests and test norms, suitability of application to population groups, various factors of case history and testing conditions which might influence test scores) the studies reported throw real light on the hereditary range of the development of intelligence among different individuals, and the variations, within such range, effected by different environments.

To be markedly effective, differences in environment must be extreme, they must commence at a very early age, and they must continue over a long period. The hereditary range, within which environment may operate to fix intelligence, differs markedly in extent with different individuals for different environments, although it may be averaged for any group subjected to similar influences.

Individual idiosyncrasy is manifested in the histories of identical twins reared apart whose intra-pair differences in I.Q. varied from zero to seventeen points.

In regard to the influence of physical factors, health, disease, injury, *etc.*, on intelligence, the evidence is strikingly and consistently negative, except in those cases of extreme injury, toxic condition, bacterial invasion or other damage to the central nervous system. And in not all of these instances can impairment be noted, for nature is surprisingly alert, not only to set safeguards around the nervous system, but to offer vicarious functioning for injured parts and to offset damage by other compensatory devices.

### Group Differences in Intelligence

Data are at hand on comparisons between certain specific population groups, chief of which are home-cultural, socio-occupational, and rural-urban classifications. The extent to which obtained differences are dependent upon innate (hereditary) bases, or upon environmental handicap and advantage, has not always been easy to determine.

Burks and Freeman have offered estimates of the range within which intelligence may be modified by such differences as exist



between very different, but not unusual American homes, and tentatively suggest that a variation up to ten points in the average I.Q. of different groups may be caused by such environmental differences as normally exist between American homes today (social groups), while differences as great as thirty points may be caused in extreme individual cases; or by extreme differences in environments (*e.g.*, from the very poorest to the very best homes).

It must constantly be borne in mind that the above estimates are based on American populations as they exist today, with I.Q.'s calculated on the basis of present-day tests. It is quite conceivable that a shift in the average mental quality of the American population, either upward or downward, a curtailment of certain extremes (biologically or socially), a change in the content of test material (*e.g.*, stress on other than verbalization)\* might alter these raw figures. As they stand, they are adequate to express the conditions here and now.

Studies of rural-urban groups have found consistently a higher average in intelligence for the urban groups. Jones has placed this at ten points. The nice problem which has not been clearly settled is whether this represents a selection of duller individuals who remained on the farms, whether the test materials are equally fair to the rural Subjects (since they were largely standardized on city children) or whether the rural environment, *per se*, has been operating to hold down the mental development of its residents.

Of special significance, because her study has ruled out the interlocking effect of parental proximity, are the findings of Lawrence, that children who have been separated from their parents since birth, nevertheless tend to maintain the original group differences which characterized their parents. This tendency is the more striking in that all these children from various original social levels were reared together in a common environment. Children born of socially superior stock, but reared since birth with children born of socially inferior stock, continue to manifest their genetic superi-

\* The stress which has recently been placed on the relative invalidity of intelligence tests because of their highly charged verbal content must always be coupled with the point that the acquisition of verbal materials needed to think out a problem in learning, adaptation, problem solving, etc., is in itself an evidence of ability to learn. While size of vocabulary is of necessity in close relation to environment, it is probably in still closer relation to native brightness. Eloquent testimony to this determiner of individual ability is always to be found in variations within a group of individuals having had equal opportunities as far as exogenous stimulation is concerned. The extent, for instance, to which different members of one household, attending one school, and having access to the same books, etc., differ among one another, is directly dependent in nearly all cases on original differences in brightness to learn.

ority in spite of uniform rearing. An average difference of eight points between Lawrence's second highest and second lowest groups was obtained. Clearly here is evidence of hereditary determinism.

## *ii. Personality and Environment*

Studies of the development of personality, like measures of personality, have been to date far less adequate than those of intelligence. Lacking direct evidence from experimental material, we have presented instead the points of view of various psychological schools and leaders. These views are for the most part immensely stimulating, but lack controlled experimental support. To reconcile the views, for instance, of such an extremist group as the behaviorists, with such a group as the maturationists, is scarcely the province of a reviewer of data. In the light of the evidence now available we must perforce swing into middle ground.

Again the analytical method applied to data in other sciences—the tendency to divide a whole into its separable and component parts—runs directly afoul of the point of view of the Gestalt psychologist, whose emphasis is on interdependence and wholeness—a wholeness not possible of separation into elements. Personality is a growth and an interaction of variable upon variables. Hence group measures of this or that personality characteristic, are, at best (even from a not strictly Gestaltist approach), highly artificial, in that they do not reflect what comes before and what comes after the presence of the particular characteristic measured (by test or observation) in each Subject.

Personality is dynamic, not static. It is interaction and integration, and the possible combinations and permutations of Self and Non-Self become almost finite, especially when Self and Non-Self are never static.

If we were to venture an emergent opinion from our readings, it would be that differences in personality—in emotional, volitional, affective and attitudinal traits, are enormously influenced in their expression by environment. That heredity sets definite limits to intellectual capacity, we can be sure of. That heredity also differentiates underlying temperaments—generalized emotional disposition (which are biologically, possibly glandularly, based)—seems to be a reasonably good hypothesis; certainly differences in simple disposition are evident among new-born babies; some being quick, nervous, easily upset, others slow, perhaps stolid and relatively placid.

## III. CONCLUDING COMMENTS

In respect not only to personality, but to intelligence as well, we must conclude that the material which has been presented does not answer very specifically the questions which were proposed for solution in Chapter III. At best, these studies only sketch the broad general limits within which more exact answers must later be found. And it must again be emphasized that the problem of heredity and environment is not a general problem, but is specific to each individual, to each of his characteristics, and to each environment.

This much, however, can be said. The extreme conclusions frequently voiced by some "Environmentalists" on the one hand, or by extreme "Hereditarians" on the other, do not find justification in the facts. They exceed the limits set by the studies already available which no thoughtful student can longer afford to ignore: The evidence that there are important differences among individuals in hereditary capacity for intelligence, is entirely conclusive; the variabilities and averages of large numbers of individuals under influences of varying environments are in process of being quite accurately determined. And there is strong evidence, from studies made in this country and in England, that the higher intelligence of the upper socio-economic groups as compared with groups lower in the socio-economic scale, is to an important extent due to differences in hereditary capacity.





## APPENDIX

### FIELDS OF FUTURE RESEARCH

The studies reviewed in this compendium indicate several trends.

(1) A scientific awareness on the part of the psychologist of the need of an experimental approach to the heredity-environment riddle.

(2) The comparative recency of adequate scientific studies.

(3) The tremendously greater range of individual differences within a group than differences to be found between any two groups. Variation among individuals is consistently more significant than differences in group averages. Indeed, a comparison of any two groups, racial, social, geographical, *etc.*, always reveals a wide overlapping from group to group, due to this dispersion of individuals, varying about a central tendency. Future research should devote itself largely to investigating factors behind such variation.

(4) Of special importance is the material supplied by Newman on identical twins reared apart, by Burks and Freeman on the influences of cultural environment on foster children, and by Lawrence on the significance of heredity in social differentiation.

Newman (and Müller) have reported on ten cases of identical twins reared apart since infancy. Each case history is a revelation in itself, since no two sets of twins duplicate each other either as to initial equipment or as to environmental influences. Our interest is not only in the degree to which any two members of a pair maintain their genetic similarity, but also as to the various points, qualities, and expressions on which they differ, the extent of such differences, and always in relation to original make-up and environmental differences. However, ten cases are not very many, and environmental cultures for the mates have not always been very different. With extreme differences more pronounced results might be expected until a point is reached, beyond which development could not be affected. If fifty or more such cases could be gathered here and abroad (one feels that European sources have not even been tapped! \*) then we would not only feel much more secure in our deductions, but we might discover real trends which ten separate cases have not yet revealed. Our debt of gratitude to the zeal, energy, and tact which Newman and his workers must have displayed in their pursuit of cases, is very great.

The studies of foster children, led by Freeman and Burks, and subject

\* In a recent note it is reported that such a collation of data is about to be undertaken in England. (*Char. & Pers.*, 1933.)

to limitations already discussed in our text (pp. 275 f.) have opened up a line of research which might well be continued. It is to be hoped that increased measurement in our schools and more professional standards in our social agencies will make available in future more adequate records on pre-adoptive data; such as mental status of own parents, quantitative ratings of homes and other culture factors, more detailed items on development, *etc.* In time, too, we hope that Terman's ideal experiment (p. 255) may be projected.

The attack, initiated by Lawrence, should serve to stimulate and guide much future research along the same line. Again, with more refined data on parental measurements (Lawrence used occupational groupings) one can expect more pronounced results. The fact that Lawrence found eight points average difference in I.Q. between the children whose parents were in the B group of occupations compared with those of the D group, though all the children were brought up in the same orphan asylum environment, must be regarded as highly significant. Coupled with this, it must also be borne in mind that parents in Lawrence's data, listed as from the upper economic groups, are probably but very poorly representative of their class. Socially adequate parents are less likely to give up their children to a foundling home. A similar study in America might reveal more startling results.

The future should see the above studies repeated in other places and with other cases. Their range of subjects should be extended and their techniques of measurement and analysis refined. More desirable still, it is to be hoped that special conditions can be set up experimentally and the results observed over a long period of time.

More immediately possible of realization is the approach already undertaken by Jones, Greene, Shirley, and others on the growth and development of separate mental processes within the composite "general intelligence." Jones has studied sub-tests, "items" in the Stanford-Binet; Greene has standardized certain mental and motor functions of his own selection; Gesell and Shirley have recorded sequences of growth in the mental and physical field; Kelley and Spearman have tried to unravel statistically unique traits; others must take up the task of showing the differential effects of varying environmental factors on the development of these traits or processes.

Other projects for future investigation which might well be included in an heredity-environment research program, and which have been suggested here and there by workers conscious of their significance, include such problems as the following:

1. "... the identification of analytic entities in the young child, with the possible heredity of such entities, and their neurological correlates." (Murchison, 1931, Preface.)

2. The relative sensitivity of various mental processes (functions, entities, unique traits) to environmental effect. For preliminary research some that seem empirically to be distinct wholes can be selected, *e.g.*,



vocabulary, visual memory or form, musical sense, mathematical sense, *etc.*

3. The constancy of ability of above functions from year to year in the growth process. Such research should throw light on general problems of constancy of I.Q. (Greene, Bagby.)

4. The constancy of I.Q. for different levels: C. A., M. A., I.Q.

5. Construction of measures of many environmental variables.

6. Careful correlational studies between different environmental variables (*as measured*) and development of intelligence.

(a) Home environment for various ages (as Van Alstyne has done for the three year old).

(b) Home environment for various racial groups.

(c) Various elements of environment in relation to intellectual variables.

7. Studies of the influences on mental development which discriminate between city and country children; (*e.g.* familiarity with pictures, handling of money, speed of reaction, opportunities to converse, *etc.*), with intensive training of the handicapped group to note how it compares with the advantaged group.

Similar program of training country children from infancy on (using control group) in greatest possible vocabulary development and command of verbal expression.

Such studies would serve to indicate the extent to which *power* can be acquired to do the sort of things which now favor one group at the expense of the other in verbal tests.

8. a. Differential effect of bi-lingualism on various congenital levels of I.Q. (controlled conditions).

b. Research on facility in learning English by foreign-born, classified according to native social origins.

Such studies would serve to indicate the significance of the congenital factor in adaptation to a new language environment. Hitherto stress has been laid on the handicap laid down by the environment with little or no attention paid to individual differences in potential for acquiring the new language.

9. Physical factors and intellect.

a. Better measures of vitality, physical fitness, vigor, stamina, *etc.*

b. Correlation of mental and physical growth in infants and pre-school children, at which level, growth may be more significant as an index of intelligence (quality of organism) than at a later age.

c. With influence controlled of age, sex, nationality, socio-economic status, *etc.*—fuller studies on physical defects and physical condition and intelligence.

Interesting indications have suggested a correlation between mental and physical traits. It is common observation that large numbers of low grade feeble-minded are characterized by physical stigmata. Exceptions of course occur. Suggestions have also come that desirable qualities of

health, beauty, physique, intelligence, and personality are positively correlated within the individual. It is a field of real concern to the sciences of man.

10. Investigations into the correlates of exceptional ability would offer a criterion of eugenic selection.

Any plan for race improvement should first become acquainted with the correlations among characteristics. For instance, the fact has been noted that race horses of the first rank tend to have blood vessels that burst easily. There is a popular opinion that genius and madness are closely allied in man. Scientific enlightenment is much to be desired.

11. Effect on I.Q. of physical corrections (*e.g.*, tonsillectomy, glandular therapy, diet, ultra violet, and other ray treatments) which take into consideration: Length of time disease was present; age at which correction was introduced; seriousness, degree of complaint (prior to therapy), and post-therapeutic interval.

12. After-effects on I.Q. and personality of various diseases and accidents, infections, infectious diseases (scarlet fever), paralyses, *etc.*

13. Does age of mental maturity offer a clue to variations of adult intelligence in individuals, some of whom reach their full maturity at twelve, fourteen, sixteen, eighteen, twenty years, *etc.*? Where records are kept, do those stopping at later ages turn out (say at twenty-five) to be brighter than those stopping at earlier ages? (G.C.S.)

14. (a) More intensive studies on anthropological and psychological similarities between parents and children in all classes of society.

(b) Do "only" children having much of their parents' time resemble their parents more in psychological characteristics than children of large families?

From extended data of the above sort, a definite contribution might be made to controversies arising on the paternity of certain infants.

15. Research suggested by Stockard: The human brain retains more of immature and foetal proportions than other mammals. This suggests research on size of face (in relation to cranium) and amount of intelligence.

16. Physical factors and temperament. Such research will necessitate better measures of personality than we have at present. It is desirable to check Kretschmer's hypotheses; to establish close contact with recent findings in bio-chemistry and endocrinology.

If personality is basically controlled by glandular make-up, and if glandular balance can be altered by medical intervention, the studies pursued by endocrinologists should be of intense interest and importance to the student of man. In this field, probably more than any other, lies a hope of race improvement, not directly depending upon eugenic selection.

To the student of mental, emotional, and physical heredity, a structural basis is indicated from which these traits can be studied.

17. Lashley suggests as important in personality study: Research on *motivation* in behavior: origin of temperamental differences; their bio-

logical bases and nature; their stability; their significance for adaptation in modern society.

18. Detailed examination of biographies to note the extent to which eminent men rose above their environment.

19. A follow-up investigation of "unlit lamps" (*i.e.* highly promising ability among young individuals which never blossomed into great achievement).

20. The genetic mechanics of heredity, as in Tryon's animal experiments.

21. Burks offered the following suggestions at the Atlantic City meeting of the A. A. A. S., December 1932:

(a) Controlled experiments on influence of home, school, community, *etc.*, using controlled community conditions, as, for instance, the result of intensive study of two sets of families—the population of two comparable factories—one group of families being guided, the other not.

(b) Terman's controlled experiment in which he would take 500 sibs born into inferior conditions and elevate them into a higher cultural level at birth, leaving their sib mates at home.

(c) School and I.Q. What effect may schooling have on children who have never had any?

(d) Community effects. Level of community and its effect on all its members.

(e) Carter. Differences in adult identical twins separated for various years in adulthood.

(f) Burks. Overlapping effects of environmental influence: *E.g.* is the teaching of nursery school and home additive or overlapping in such activities as reading to children, or teaching reading, or number work?

(g) Race psychology. Establishment of an inter-racial orphanage in which children of all races are reared together.

(h) Genetics of mental heredity. Dominance and recessiveness of intellectual characteristics. Regression of offspring on parents at different levels of mental ability.

(i) Conrad. A three generation study of the transmission of mental traits.

(j) Tryon. Breeding strains of rats for ability to learn. Effect of special types of nurture on strains of homozygous rats.

22. Jennings. To what extent may nurture bring about *power* of adaptation and learning: *E.g.* to what extent may education bring about *power* to respond to training?

23. In what special fields of intelligence (*e.g.*, spatial sense, perceiving, motor activities, verbal ability, *etc.*) will training increase individual differences? And in what psychological fields of activity is training relatively powerless to increase individual differences? (G.C.S.)

24. As we look ahead toward social changes and trends, such as those now more or less clearly recognized, what effect may we expect



these trends to have on individual differences? *E.g.*, the better the school system, the more magnified are inherent differences, and the more important the hereditary contribution. The more curtailed the hereditary range of differences, the greater becomes the significance of environment in creating final differences. (G.C.S.)

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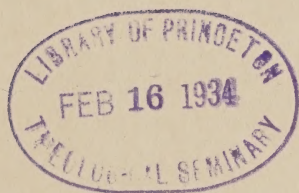
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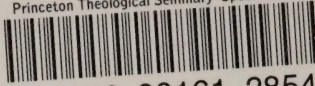
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